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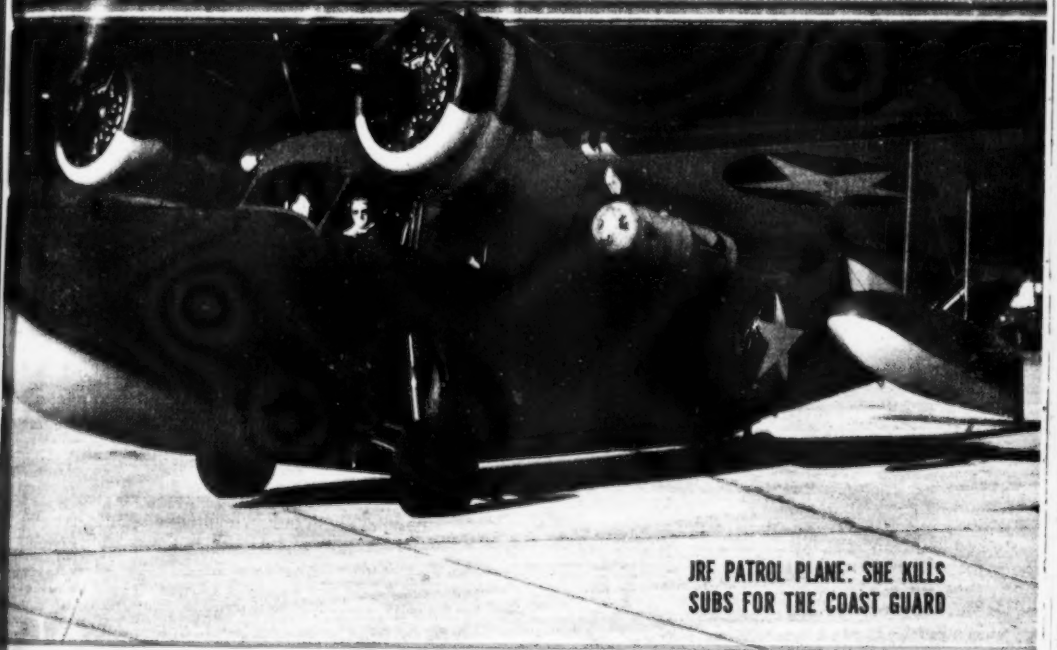

JRF PATROL PLANE: SHE KILLS SUBS FOR THE COAST GUARD

"WINGS, BOMBS AND BULLETS"
BY GEN. HAP H. ARNOLD

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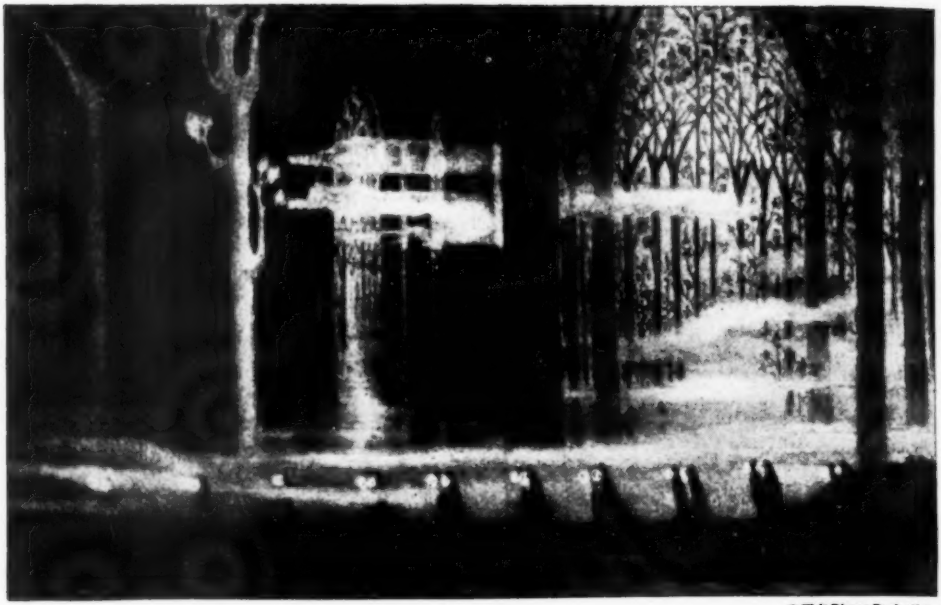

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What's the word you think most of at Christmas?

THERE'S one word men of good will everywhere associate with Christmas.

That word is *"Peace. Peace on earth"*. . .

There can be no peace this Christmas. Not one of us would want the only kind of peace there could be, an inconclusive peace.

But we do want the right kind of peace as soon as possible. And this Christmas we can help hasten the coming of that wonderful day, by making War Bonds our chief gift.

Every Bond you buy brightens the chances of a better world than man has ever known.

How, then, could you possibly give a better present than Bonds, Bonds, Bonds? Give them to each member of the family. Give them to your friends. Give them to *everybody*.

Give War Bonds for Christmas

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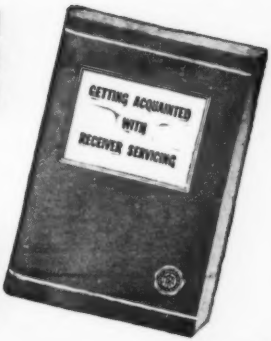

There is a Shortage of Radio Technicians. Many Good Jobs are Open!

There's a big shortage today of capable Radio Technicians and Operators. Fixing Radios pays better now than ever before. With new Radios out of production, fixing old sets, which were formerly traded in, adds greatly to the normal number of servicing jobs.

Broadcasting Stations, Aviation and Police Radio, and other Radio branches are scrambling for Operators and Technicians. Radio Manufacturers, now working on Government orders for Radio equipment, employ trained men. The Government, too, needs hundreds of competent civilian and enlisted Radio men and women. You may never see a time again when it will be so easy to get started in this fascinating field.

Be Ready to Cash in on Jobs Coming in Television, Electronics

Think of the NEW jobs that Television, Frequency Modulation, Electronics, and other Radio developments will open after the war! You have a real opportunity. I will train you to be ready to cash in when Victory releases the amazing wartime Radio developments for peacetime uses!

Many Beginners Soon Make $5, $10 a Week EXTRA in Spare Time

Right now, probably in your neighborhood, there's room for more spare and full time Radio Technicians. Many N. R. I. Students make $5, $10 a week EXTRA money fixing Radios in spare time while learning. I send EXTRA MONEY JOB SHEETS that tell how to do it!

My "50-50 Method"—half building and testing real Radio Circuits, half learning from easy-to-grasp, illustrated lessons—is a tested, proven way to learn Radio at home in spare time. Think how much practical experience you'll get by building the "Superhet" and Measuring Instrument illustrated at right—by conducting 60 sets of experiments on these and other Circuits you build with parts I supply! Within a few months you can be ready to run your own Spare Time Shop, fix the Radios of your friends and neighbors—get paid while learning!

START NOW Toward Radio's Rich Rewards!

MAIL THE COUPON. I'll send you the FREE Lesson and my valuable, 64-page, illustrated book. They're packed with facts about Radio. You'll see snapshots and letters from men I trained, so you can know what N. R. I. did for others. You'll read a description of my Course—"50-50 Method"—6 Experimental Kits—Extra Money Job Sheets. You'll have my free Lesson to keep. And you'll see many fascinating jobs Radio offers and how YOU can train at home. No obligation—no salesman will call. If you want to JUMP YOUR PAY—Mail Coupon in an envelope or pasted on penny postcard! J. E. SMITH, President, Dept. 4AH, National Radio Institute, Washington 9, D. C.

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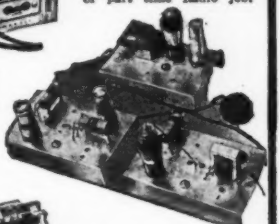
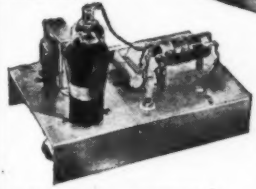


MEASURING INSTRUMENT (above) you build early in Course. Use it in practical Radio work to make EXTRA money. Vacuum tube multimeter, measures A.C., D.C. and R.F. volts, D.C. currents, resistance, receiver output.



SUPERHETERODYNE CIRCUIT (above) Preselector, oscillator-mixer-first detector, I.f. stage, diode-detector-a.v.c. stage, audio stage. Bring in local and distant stations on this circuit you build yourself!

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VOL. XXXI NO. 3

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On the cover: the Grumman Goose, Coast Guard JRF Patrol plane. Kodachrome by Rudy Arnold.

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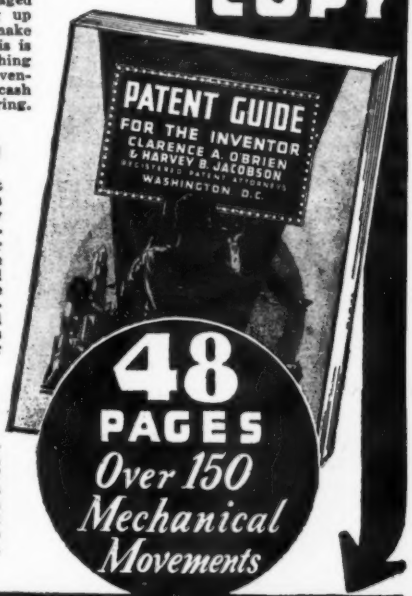

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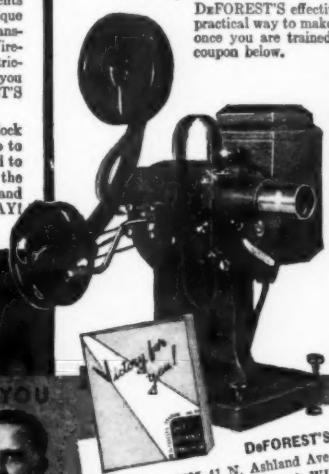

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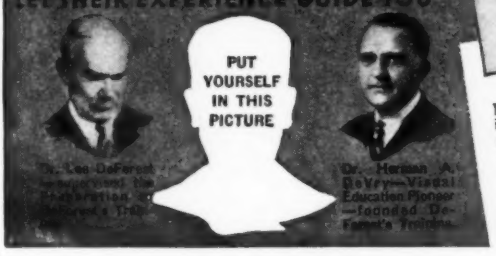

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Improvised Axe

Owen Seaboyer, Shelburne, Nova Scotia, Can., has designed an axe made from the spring leaf of an automobile and asks our advice on its possibilities.

ANSWER: *At first glance this would appear to be the sort of a thing which should find its way into the construction pages of this publication. However, it possesses certain inherent characteristics which make it appear worthy of some measure of protection. Obviously, the construction is most economical. With modification of the design you submitted it should be possible to produce a continuous wedge-shaped cutting blade.*

We would recommend that you experiment with changes in your present design so that you get a more perfect wedge. We would then advise that you try to insure security of the handle in this modification, following which you should have a patent search made to determine if the item presents the necessary requirements of invention.

Marketing Basket—Watch Protector

Mrs. Hoyt, Buffalo, N. Y., sends a sketch and description of a new style of marketing basket and a transparent watch protector.

ANSWER: *In accordance with our policy not to disclose details of items which we consider possessing merit, details of construction are omitted in this department.*

A number of marketing baskets have been produced. One of the new designs recently published is for a one-wheeled cart.

When your marketing basket is empty it appears burdensome; when half full, there is danger of spilling its contents. Finally, much of the support depends upon the stature of the individual using it; hence, some provision would have to be made for changing the height of the support to add to the comfort of the user.

Some of these objectionable features can be eliminated by a modification in design. We believe that your construction could be greatly simplified and we would suggest that you make up a few miniature samples of the different designs possible; if necessary you can build them from cardboard and paper.

We are not favorably impressed with your watch protector. Such a protector would have to be designed to hold a specific size and shape of watch. It must be so constructed that it will open easily to permit winding the watch and yet it is expected to be water- and dust-tight. We cannot see how you expect to accomplish both aims. Frequent opening and closing the case definitely would wear the edges and destroy most of the valuable features.

We advise no action with the latter item.

Burning Oxygen

Donald Ferris, Valley Station, Ky., asks, "Can compressed oxygen be burned without being broken down? Would a stove burning compressed oxygen be practical? What is the advantage of sending your idea to yourself in a registered letter?"

ANSWER: *Compressed oxygen does not burn. It merely supports combustion. The suggested stove would not work.*

Sending an idea to yourself together with complete and full description in a registered, stamped self-addressed envelope can establish a claim of priority. It shows by the postal designation on the envelope the date when the plan was conceived, drawn-up and mailed. The back of the envelope indicates by postal designations that the contents were not tampered with. A duplicate for consultation should appear in some memorandum book. The contents of the envelope, however, should not be disclosed except in court if it becomes necessary to substantiate your priority claim in an action.

Burr Removing Tool

L. R. Schmuck, Battle Creek, Mich., submits a design of a tool for removing burrs from holes in machined surfaces. He would like our opinion of the device.

ANSWER: *We do not recall having seen a tool similar to the one you have designed. It certainly appears to possess great usefulness. Only several sizes will be required to accommodate a large variety of holes. This tool should be in use today not*

[Continued on page 145]

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CHIPS *from the* EDITOR'S WORKBENCH

Contest!

IN THE past three years, MECHANIX ILLUSTRATED has become famous for its annual Word Game Contests. Hundreds of thousands of our readers have enjoyed themselves playing MI Word Games. In the past three years, we have given away airplanes, an automobile, radios, watches, lathes and all manner of valuable prizes to the participants in our contests.

Once more this year—for the fourth time—we are going to have an MI Word Game Contest. But this year, to make our game even more attractive than it has been in the past, we are offering prizes consisting of War Bonds and War Stamps—100 of them, in all!

First prize, as you will see by turning to our announcement on page 39, is $1,500 in War Bonds! What a prize to shoot for! And then take a look at the following prizes: 2nd: $1,000 in War Bonds; 3rd: $750 in War Bonds; 4th: $500 in War Bonds; 5th: $250 in War Bonds; 6th: $175 in War Bonds; 7th: $125 in War Bonds; 8th: $100 in War Bonds; 9th: $75 in War Bonds; 10th: $50 in War Bonds; 11th to 25th prizes: $25 in War Bonds each—and 75 prizes of $5 each in War Savings Stamps.

There's *really* something for you contest fans to work on! And how can you lose? You'll find the MI Word Game Contest more fun than crossword puzzles, more interesting than acrostics. The winner will be selected on skill alone—no 25 word slogans or essays to write. You'll find it a game you can't resist.

The Fourth Annual MI Word Game Contest will start in the February issue and continue through the March and April issues. You'll all want to enter. But a word of warning: due to the paper shortage, it may be difficult for you to buy MECHANIX ILLUSTRATED; so order your copy of the February issue in advance at your favorite newsstand. Or, better yet, send $1.50 to Fawcett Publications, Greenwich, Conn., for a year's subscription to MI, so that you may be sure of obtaining your contest copies. BUT ORDER YOUR SUBSCRIPTION AT ONCE! DON'T DELAY! You'll find a handy coupon on page 146.

Next Month

WE'VE lined up what we consider a standout group of features for you in our February issue of MI. Here's a peek at some of the stories we are getting for you:

P-40 TO 47: Major J. J. Kruzel was in the Philippines as a P-40 combat pilot when the Japs struck, December 7, 1941. He's been fighting ever since. Meantime, he's graduated from his P-40 to a P-47 Thunderbolt. In the first of a two-part article, Major Kruzel tells you about the development of American fighter planes and fighter plane tactics since we were plunged into the war.

YOUR POST-WAR WORKSHOP: An intriguing article telling you how to plan and lay out the modern home workshop you're going to have after victory.

MODEL T HELICOPTER: The PV Engineering Forum, Inc., of Philadelphia has built and test flown the first helicopter deliberately designed for sale to civilians after the war. It's the "Model T" of helicopters. An MI writer and photographer were present at the first test flight and bring you an exclusive story of this model which is bound to make aviation history.

TAILSTOCK TURRENT FOR LATHE: If you

[*Continued on page* 152]

VIOLIN FROM AN EGG CRATE

Frank B. McGrady, Mattapan, Mass., made this violin from the wood of an old egg crate, and has derived many hours of pleasure from playing it. According to Mr. Frank Chrostowski, who submitted the picture, the instrument has beautiful tone, and cannot be told from a factory made one. That should encourage workshoppers who'd like to try a hand at making musical instruments. This snapshot nets a $5.00 Workbench award and a Certificate of Merit.

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I FILMED OUR ALEUTIAN VICTORY

by Lt. Virgil Ellsworth, U. S. Signal Corps

MY FIRST job of photography in the Aleutians came up unexpectedly on a transport headed out for Adak. I'd been down below, talking about the folks back home, when a loudspeaker blasted right in my ear, *"Submarine off the starboard bow."* Three minutes later I was on deck, and the gun-crews were in position and depth-charges already going off.

I had it with me—and it was evidence of presence of mind—a 35 mm. still camera strung around my neck, a Speed Graphic and six film-holders under one arm, and my Cine Special under the other. I was also a little busy trying to tie a life-belt around myself. (I had no luck at all. Later I discovered that I had a child's life-belt, probably the only one on board the ship.)

Lt. Virgil E. Ellsworth is a Californian who entered the Signal Corps as a sergeant. He was recommended for his lieutenant's commission after he had filmed the documentary war cinema, Report on the Aleutians. Before entering the Army, he had his own studio in Hollywood. His prints have won many photographic awards.

It was good stuff for a photographer with plenty of equipment and prepared for any emergency. We were out in the middle of a gray and dismal-looking sea, with a destroyer circling us like a broody hen and dropping depth-charges with a preoccupied air. Those charges made beautiful photogenic splashes with plenty of color in them and there was splendid human-interest material in the gun-crews swearing horribly because there wasn't anything on the surface for them to shoot at. And there was Sergeant Herman Crabtree of Atkins, Arkansas, wearing a hunting-knife as big as a machete, carrying a .45 pistol and a .30 caliber rifle and wearing a red sweater with an A on it that he'd won for his football prowess on the Atkins High School football team.

With all that material around me, what did I get? Just shots of depth-bombs going off. That's all.

We did have a tough assignment and all the time we were shooting our Aleutian picture we had an awful feeling of missing a tremendous lot of stuff that simply cried out to be shot, and getting only stuff that we might have done better. That's the way it felt at the time. It was so cold and damp that we had trouble keeping the leather on our cameras, and we were trying to get pictures with decent exposure, good depth, human interest and good color values and had to open up our lenses to F3.5 to get anything

"We were out in the middle of a gray dismal sea."

at all. We had to do all this without any tests (I didn't see a foot of film I'd shot until I got back to the States).

But we had a job to do. Captain John Huston—the Hollywood director in civilian life—and Captain Ray Scott, who'd been a war correspondent in China, shepherded me through some of the craziest situations a photographer or a soldier ever saw.

I'd been accustomed to plenty of lights for my photography, and color-filters, temperature meters and bright California sunshine. Up there we were asked to take color-pictures when it was so dark you'd fall in a foxhole if you didn't feel each step before you. For equipment we had standard Cine-Special 16mm. movie cameras, with wide-angled lenses (one and two-inch), Speed-Graphic still cameras, two light tripods, and a 400-foot Eymo 35mm. box. That was all.

I remember that Eymo especially. I carried it sixteen hundred miles, with the temperature at fifty below, to film the official opening of the Alaska highway. When I say traveled, I mean island-hopping from one island to another, whenever I could beg or bluff my way into a plane going in the right direction. Sometimes I got a seat on a bag of mail by snapping a picture of some flight sergeant or others in charge. It took me fourteen days to get to Fairbanks, lugging the Eymo all the way. Then, with the road officially opened and long lines of trucks rolling madly toward my lenses to break the ceremonial tape, it turned out that at fifty below zero the oil in the electric motors had frozen and the camera wouldn't turn over. I hand-cranked a movie camera for the first time in my life.

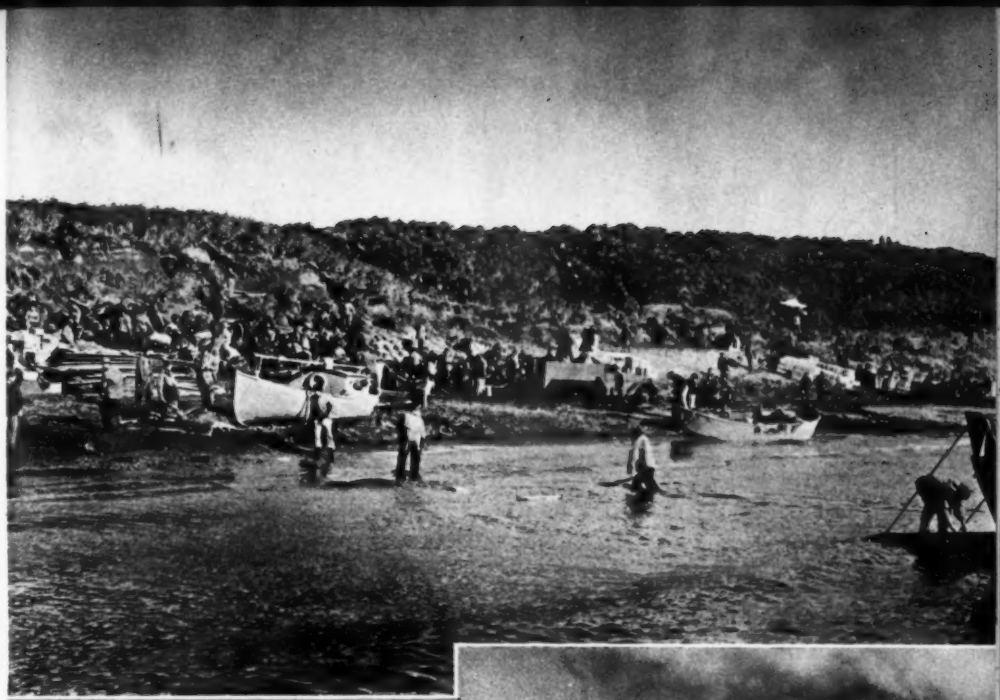
But I'm glad I wasn't recording sound, because what I was saying as I cranked wouldn't sound well on a screen.

The basic idea of the picture was Captain Huston's. He knew that we would be wasting time trying to do an action-picture with bombs bursting in air and lots of storm and strife. Besides, the typical action in the Aleutians was more a battle against the elements than against the Japs. We had to fight the elements to get the Japs. Major motion picture studios could do a patriotic action-packed story better than we could. But what we could do, and Hollywood couldn't, was to make a motion picture showing the way we had to face the realities of war, and what the realities of war actually are.

I remember one day I was on my way to an infantry battalion on the other side of Adak carrying a Cine Special. About nine miles out of Camp, my Cine Special getting heavier all the time, I came to about the fifty-second hill that had to be climbed to get where I was going. I say a hill; anybody but a Californian would have called it a mountain. I toiled up to the top of it with the icy wind blowing in my ears. And right up at the top, with a view of miles and miles of gray ocean and nothing else but the rocky island to look at, I came across a look-out post of six American

Continued

I Filmed Our Aleutian Victory



Landing on the beaches at Kiska.

soldiers. They were about the toughest-looking bunch of soldiers I ever saw. They'd been up there for eight weeks, with not a razor among them. I was the first man they'd seen in all that time, except when one of them went down for food. They'd dug a sort of niche in the mountain top where they cooked their meals.

I found them because I heard music up on that Aleutian mountain-top miles from anywhere. One of them had a guitar, which he'd nursed all the way from the States and through everything he'd been through, up to this mountain-top. When I ran into them he was leaning back and just letting that guitar talk; some were cooking supper, while the rest were bawling along to the sound of the guitar.

I spent the night there with them and when I went back down I had a movie of that boy with the talking guitar, and the others singing along with him. It's in *Report from the Aleutians*, and it means more to me than almost any other shot I took for the film.

Most of the shots were planned with just as much care as any shooting schedule was ever worked out [*Continued on page* 156]

"We had to shoot in weather so dark you would stumble into a foxhole if you didn't feel ahead.

A miniature assembly line for Vultee Vengeance dive bomber models is shown above. Models are finished.

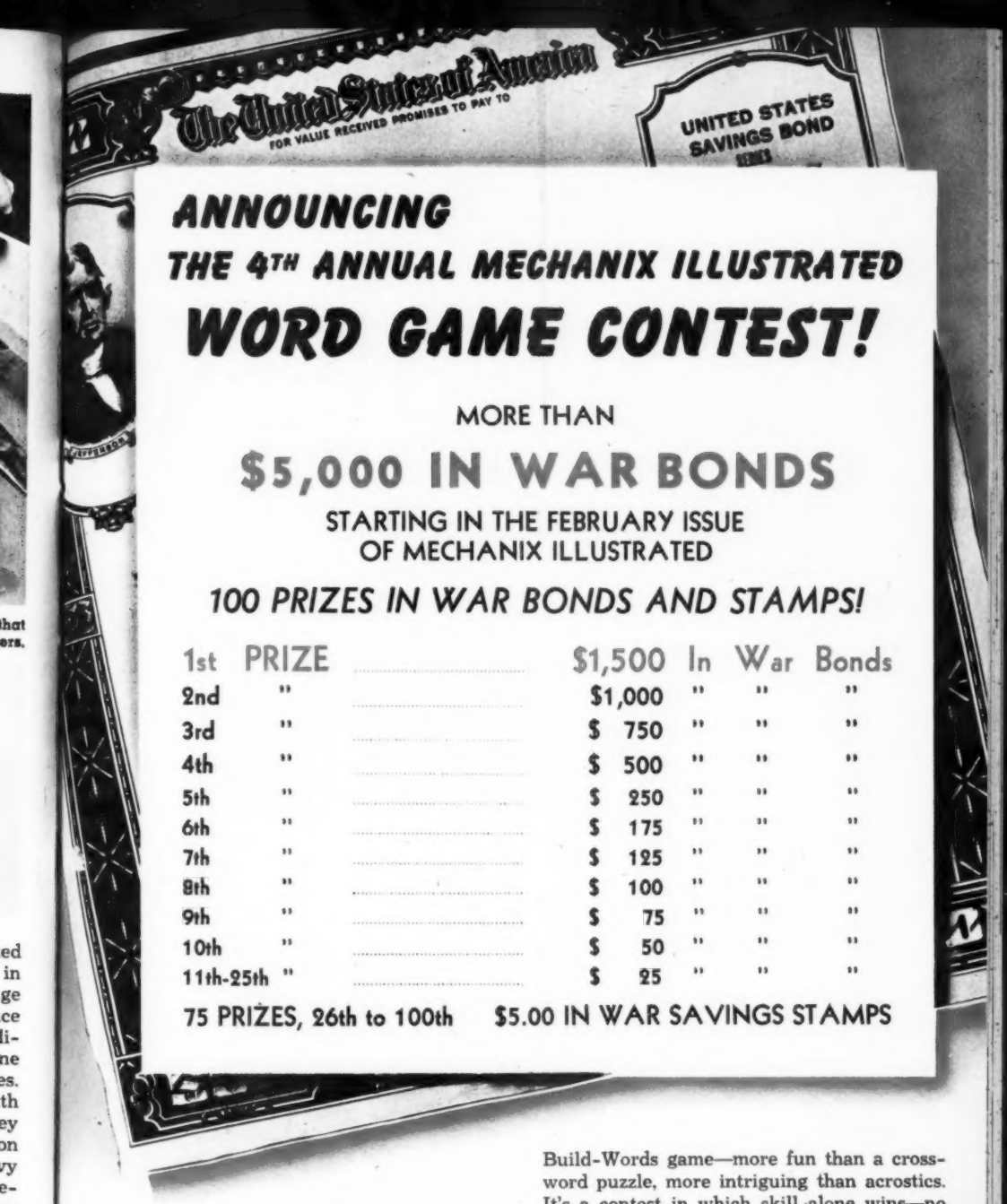
And here is a B-24 Liberator assembly line. Note that the models are even equipped with plexiglass blisters.

This is the method used by Consolidated model-makers for hand-forming with wood form and wood mallet.

MIDGET ASSEMBLY LINE

EVERYONE knows that Consolidated Vultee Aircraft Company's giant plant in California is busily engaged turning out huge B-24 bombers and swift Vultee Vengeance dive bombers—but few know that Consolidated also operates a miniature assembly line to turn out miniature B-24's and Vengeances. The models are complete in every detail, with tiny guns, radio masts, pilot tubes, etc. They are used primarily for plane recognition classes conducted as part of Army and Navy air force training. Howard and Harvey Doering who started the model shop three years ago, have turned out ships that vary from a 15-inch wingspread up to five feet. Nine men in all work in what they call "Ye Model Shoppe."

Furnaces improvised from oil cans and baling wire are used to mold the cerromatrix for baby propellers.



ANNOUNCING
THE 4TH ANNUAL MECHANIX ILLUSTRATED
WORD GAME CONTEST!

MORE THAN

$5,000 IN WAR BONDS

STARTING IN THE FEBRUARY ISSUE
OF MECHANIX ILLUSTRATED

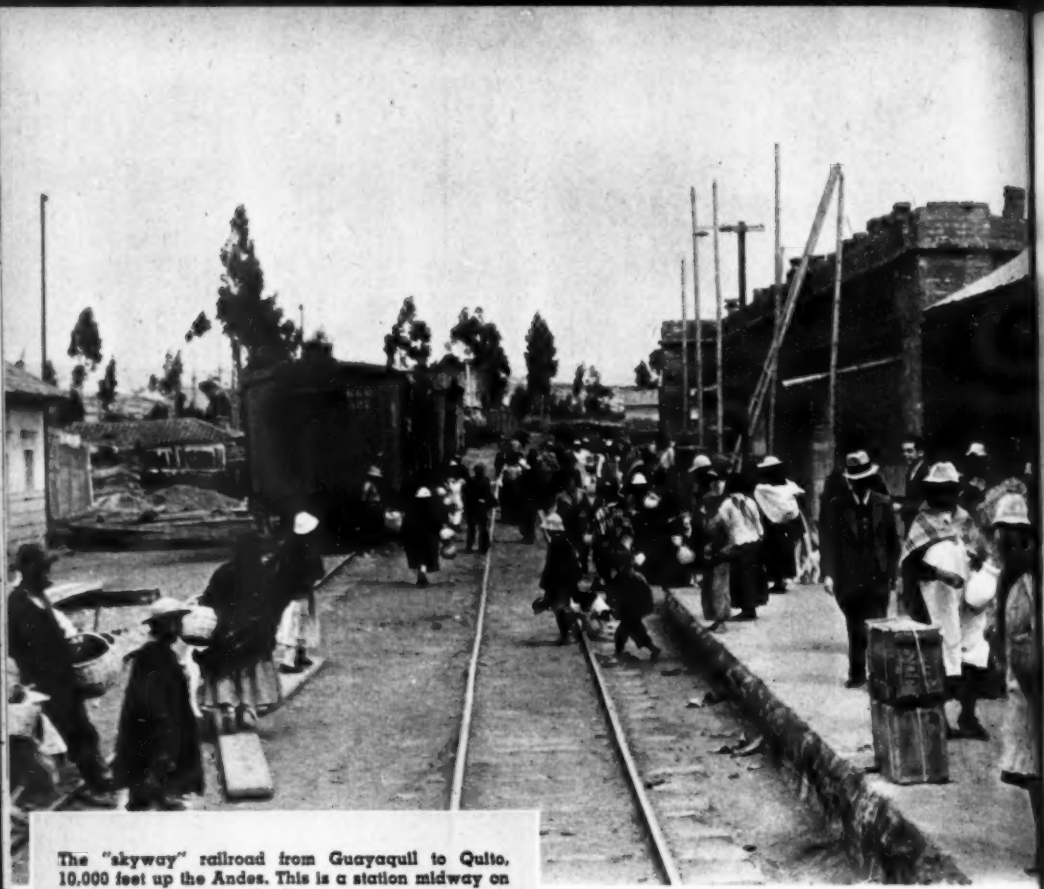
100 PRIZES IN WAR BONDS AND STAMPS!

1st	PRIZE	$1,500	In War Bonds
2nd	"	$1,000	" " "
3rd	"	$ 750	" " "
4th	"	$ 500	" " "
5th	"	$ 250	" " "
6th	"	$ 175	" " "
7th	"	$ 125	" " "
8th	"	$ 100	" " "
9th	"	$ 75	" " "
10th	"	$ 50	" " "
11th-25th	"	$ 25	" " "

75 PRIZES, 26th to 100th $5.00 IN WAR SAVINGS STAMPS

CONTEST FANS! Here we go again! MECHANIX ILLUSTRATED has become famous for its annual Word Game Contests. Starting next month, we'll have another Build-Words game—more fun than a crossword puzzle, more intriguing than acrostics. It's a contest in which skill alone wins—no "25 words" slogans. And look at those prizes! One hundred of them—all in War Bonds and War Savings Stamps. Hold your breath—and ORDER YOUR FEBRUARY MI NOW!

BUY MORE WAR BONDS



The "skyway" railroad from Guayaquil to Quito, 10,000 feet up the Andes. This is a station midway on the line.

CONTINENT OF TOMORROW

NO. 3: ECUADOR

by Henry Albert Phillips

ON THE west coast of South America is one of the treasure "high spots" on this globe, volcanic Ecuador.

By plane or ship, you'll land at Guayaquil, on the Guayas River, the only seaport. Sooner or later, you will be taking the dinky twice-a-week train to Quito, the capital, 10,000 feet up the Andes and 300 miles away. You will find yourself riding on one of the most remarkable railroads in the world; like a cobweb in the sky. Maybe you'll feel lonely amidst all that wonderful scenic panorama and long to share it with a buddy. When the conductor stands before you waiting for the ticket you will try to tell him in Spanish, stumble over the first couple of words and finally exclaim, "Aw, hell! Isn't there anybody around here who speaks English?"

The long, lean conductor will suddenly grin like a Cheshire cat, step to the corner of the car, squirt out a supercargo of tobacco juice politely behind his hand, sit

down beside you and say, "Look here, Sonny! I was talkin' what my folks down in Missouri called English, seventeen years before you were born."

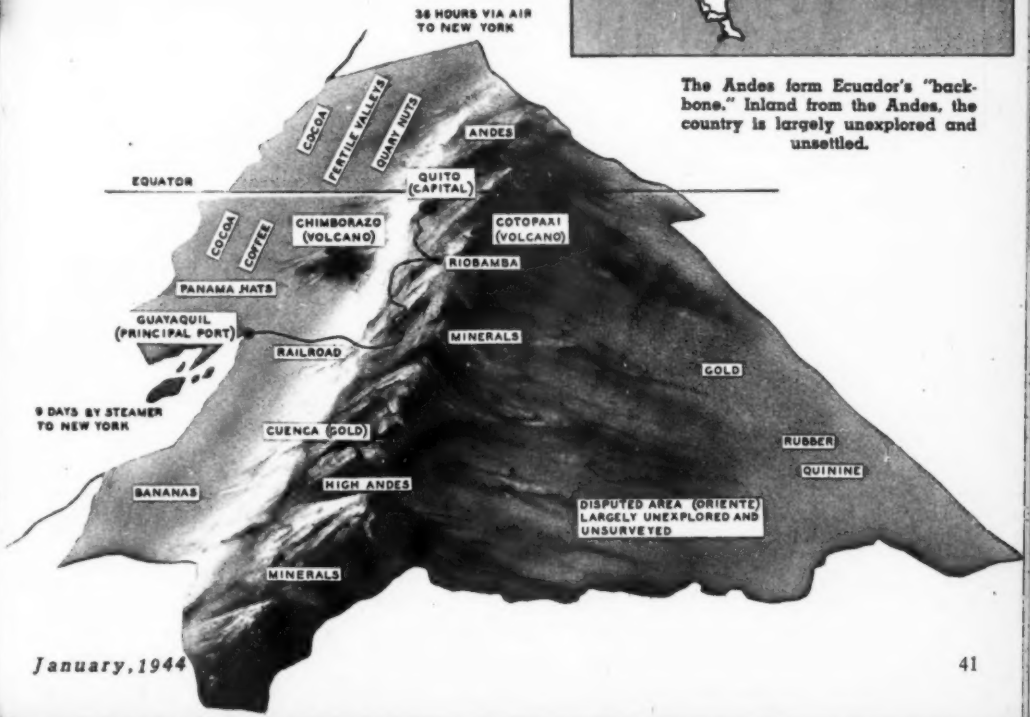
The Oldtimer begins his story, which he has told every American passing that way for the past dozen years.

"I've been railroadin' ever since I was knee-high. I worked with the C. B. & Q. long enough to be made a conductor. But I wanted somethin' more. I hired out to an agency that furnishes daredevil Americans to take the kinks out of all kinds of foreign railroads. They sent me to Mexico first, runnin' a train through a revolution. Next thing I knew I was down here in Ecuador.

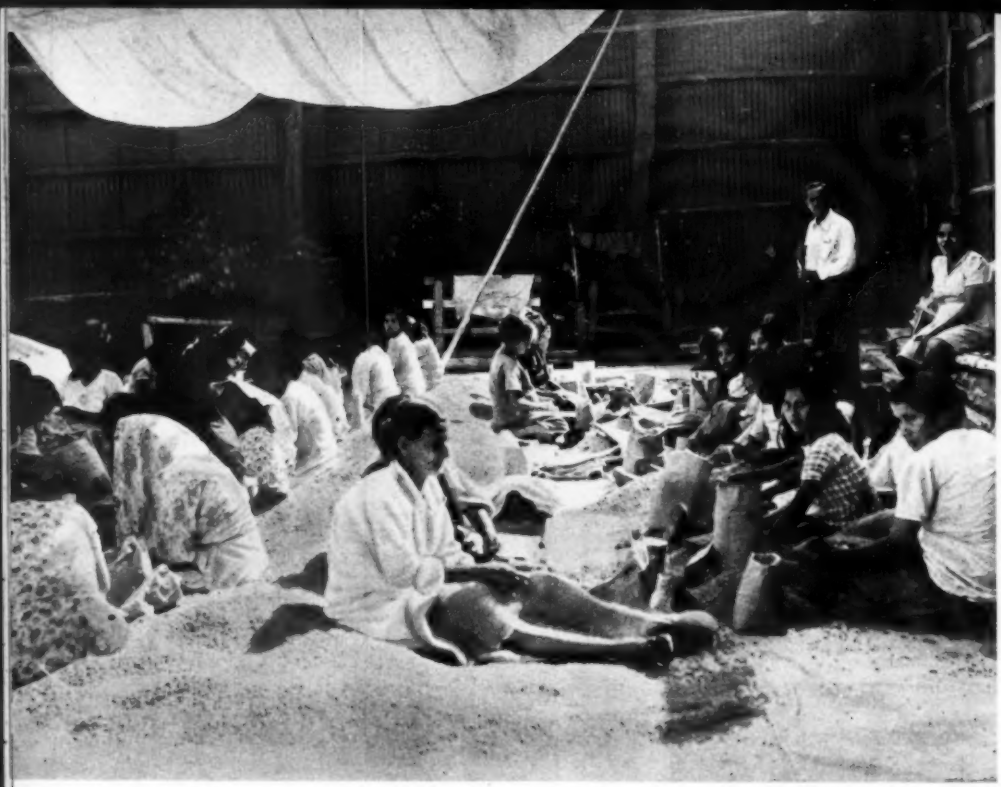
"All of a sudden one day, I run straight into the Big Thing I'd been out lookin' for all my life! An Ecuadorean on the train asked me if I wanted to buy a farm.

"Now, I was brought up on a farm and had always been hankerin' to go back to farmin' someday. I went back country with him and found a thousand acres. It's the nearest to paradise I'll ever get. The farm stretches out in a green valley between two snow-capped mountains, like a feather bed all ready to lay in. Everything is just right—made to order. Horses, a couple of cows, Indian farm hands. I even got a wife with the place—a Spanish gal as smart as a Hoosier

Third in the MI series showing you, country by country, the opportunities which await you in South America after the war.



The Andes form Ecuador's "backbone." Inland from the Andes, the country is largely unexplored and unsettled.



One Ecuadorian farmer nets $30,000 a year from his harvest of cocoa beans, a crop in which Ecuador leads the world. Here the beans are being hand-sorted by natives in Guayaquil's bazaar.

schoolmistress. I up and married her. While I'm off railroadin' she runs the place accordin' to the Missouri way of doin' things. I get around on my lay-off, one week of every four. I get good pay on the railroad and make as much more from the farm. Kinda like 'em both. Someday before long I'll reach the retirin' age with a pension, so I'm hangin' on. Altogether, that's what I call hunky dory. When you're around this way, come up and see me."

And many Americans do manage to visit him.

It gives you some idea of the kind of a place Ecuador is—an agricultural paradise just as Oldtimer discovered. The reason for all this paradise stuff lies in the simple fact that it straddles the Equator. That's what the word Ecuador means in its native Spanish, "equator." The country is just one big plantation about the size of Illinois, Kansas, Indiana, Iowa and Michigan, all put together. Even at that it's the smallest country on the West Coast, lying tightly sandwiched between Colombia and Peru. The eastern portion laps over the Andes and stretches off indefinitely into a broad immensity of tropical vegetation, known as "Oriente," for the most part still unexplored. Mountains? Plenty of them, but fertile valleys lie between them. Many of them are too hot for comfort, spurting out fire and molten lava for miles around, for Ecuador is the meeting place of the volcano clans.

Ecuador is the agriculturist's paradise that Oldtimer said it was, all right! It is sown with natural vegetable wonders. Sugar cane ten feet tall that grows for twenty-five years without replanting. Groves of palms with cocoanuts as big as your head. Wild papayas.

Continued

Continent of Tomorrow No. 3: Ecuador

like luscious muskmelons growing on big trees. Ivory nuts as hard as elephant tusks, making the most satisfying buttons, studs and combs in the world. Balata wood that was scarcely heard of abroad until they found it to be just the material to replace light metals so necessary in plane construction. Balsa wood, light as cork, grows in great forests.

The point that makes Ecuador especially promising is that it produces so many articles lost to us by the Japanese conquest of the Far East.

Take cinchona, or quinine bark, that grows wild in the forest. An ever growing need is boosting production and prices above the last export figures. The rubber harvest jumped from 1,500,000 pounds to 3,000,000 in 1940. The stimulus of war prices will push it far above that amount. Since Japan took away the bulk of our Kapok, exports from Ecuador have leaped from thirty-three long tons to 421. Kapok is a cotton silk that grows on trees and is indispensable for upholstering. It hadn't been considered worth harvesting. Now the demand is far greater than the supply. It can be forced to yield many times more, however.

There's a saying: "If anything grows on this earth, it will flourish somewhere in green Ecuador."

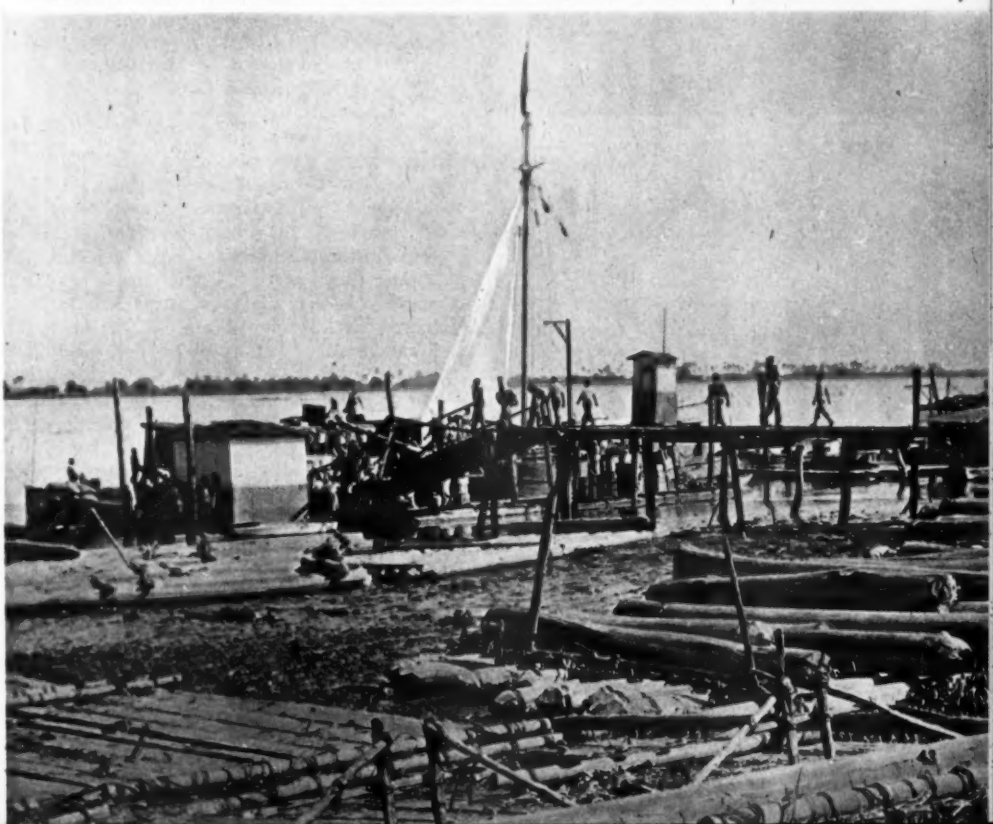
Nobody outside hears much of Ecuadorean sugar crops, or of the million and a quarter gallons of Ecuadorean rum, or of thousands of tons of excellent coffee, or of 3,000,000 pounds of good cotton or of 1,000,000 pounds of tobacco.

That brings you to Ecuador's number one export—cocoa. There are only a few countries where cocoa is raised in enormous commercial quantities. Ecuador leads them all.

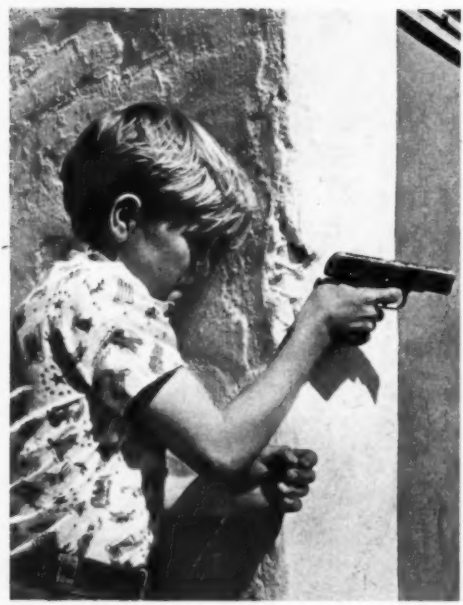
Wherever you go at sea level in Ecuador, you will find cocoa. There are more than 6,000 cocoa estates. When you travel up the Guayas River from Guayaquil, you will meet up with one farmer who has become rich just from raising cocoa. He harvests 300,000 pounds a year, at a net profit of $30,000.

Maybe you will give some thought to raising cocoa [*Continued on page* 159]

Balsa wood, light as cork and of great value, is one of many priceless products growing in Ecuador's vast forests. Here it is seen in log form, ready for loading on Guayaquil's docks.



TOY LIBRARY



AN IDEA worth copying across the nation is that developed by the Los Angeles, California, Playground Department. It is a toy lending library, where any child may borrow a toy, free of charge, just as his mother might borrow a book from the Public Library. To get a toy, the child needs only an application signed by his parents, guaranteeing the safe return of the plaything. The kids are allowed to choose from a large selection of toys and there are no restrictions other than that they return the toys in good condition. Records are kept, with each child graded "S" for satisfactory if the toy is returned undamaged; "U" for unsatisfactory, if damaged. After a child has received twenty "S" grades, he is placed on a Roll of Honor and given a plaything as a prize. According to Playground Department officials, there is a surprisingly low percentage of breakage.

In the photograph at top, right, children are standing in line waiting their turn to select a toy. The center photo shows a section of the display shelves and some of the types of playthings offered. At the left, a Wild West cowboy takes aim at a fleeing Indian with a borrowed automatic. As well as the youngsters getting the toys they want and need for childhood happiness, a sense of responsibility is developed early in life.

WINGS, BOMBS AND BULLETS

by

General H. H. Arnold

Commanding General,

U. S. Army Air Forces

WHEN the white flags of surrender began to appear on the airfield and on the hilltops of Pantelleria that morning of June 11th, it was a dramatic demonstration of what modern air power can do. Because of our relentless aerial bombardment, heavily fortified Pantelleria was forced to surrender according to terms set forth in leaflets dropped from planes earlier in the week. It was victory—by air. Nearly 2,000 tons of bombs alone were dropped upon the island in the final twenty-four hours, destroying its guns, its buildings, its planes, equipment, and supplies. We made Pantelleria's ground fortress an intolerable hell for the 11,000 men in it, and they gave up—gladly.

If the garrison had not surrendered early, much higher records of air activity would have been set. Our schedule called for increasing numbers of planes and an increasing intensity of destruction.

This same air force, increasing in numbers daily, is now carrying a greater offensive to Europe itself, bringing the war home to Berlin, Rome, and other Axis cities with a new kind of power and fear. Behind this force's creation and successes is a story of hard work by people with ideas about planes, bombs, guns, and armor that have made them the best in the world today.

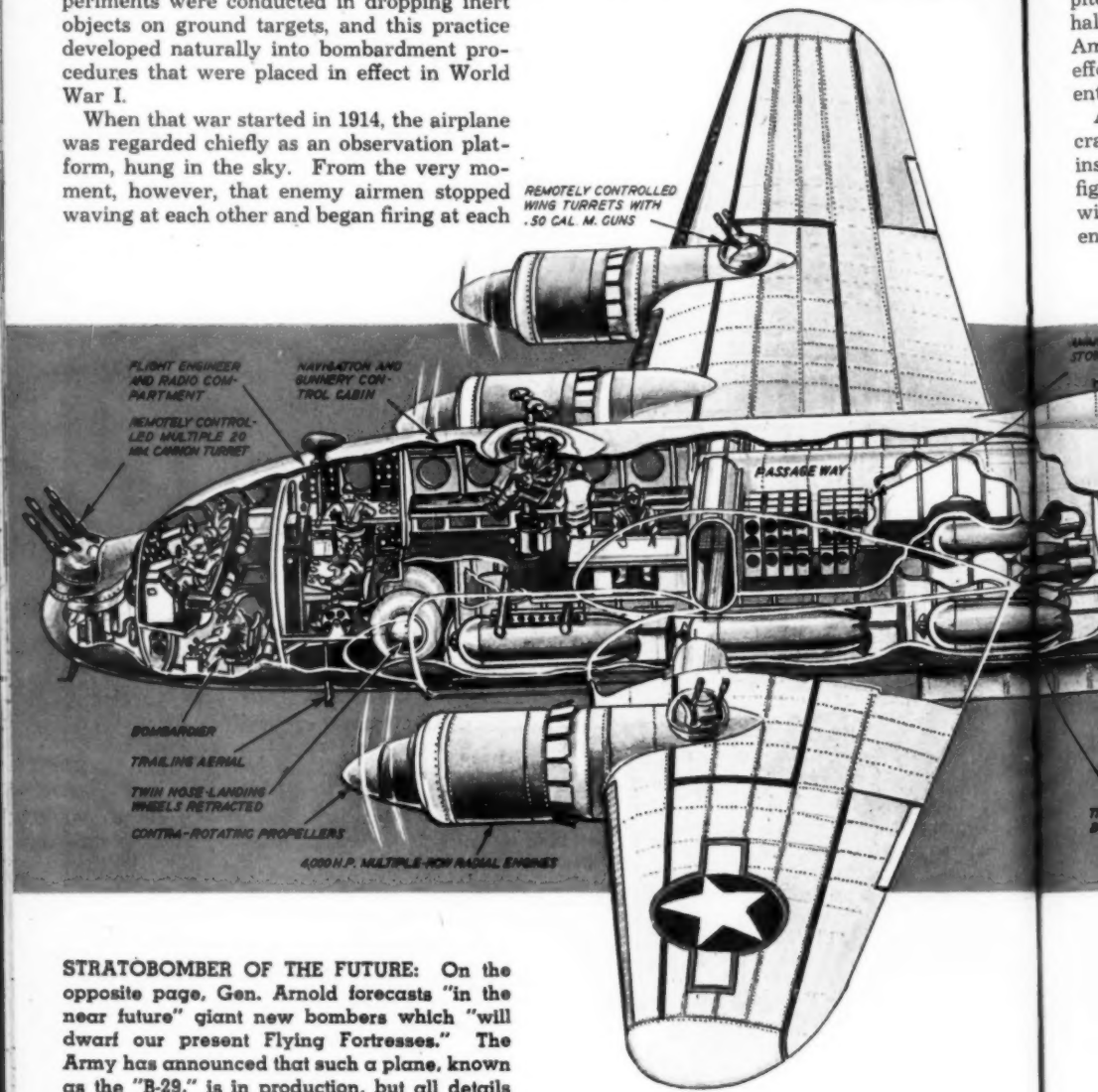
What a comparison today's air operations make with those of World War I! In four days from September 12 to September 16, 1918, American aviators made 3,300 flights over the line in the St.-Mihiel offensive, fired 30,000 rounds of caliber .30 machine-gun ammunition, made 1,000 individual bomb attacks, and dropped 75 tons of bombs. This was a performance record that drew the very high praise of General Pershing.

The arming of American aircraft dates back

GENERAL H. H. "HAP" ARNOLD is the four-star Commanding General of the U. S. Army Air Forces. A former Advisory Editor of Mechanix Illustrated, General Arnold, more than anyone else, shaped the Air Forces into the powerful combat weapon it now is. This article is printed by permission of Army Ordnance, published by the Army Ordnance Association.

to the early days at College Park, Md., when about a dozen of us were learning to fly at the Army's first air school. We used one of the earliest Wright airplanes. A Lewis gun was carried in the lap of a passenger. Initial experiments were conducted in dropping inert objects on ground targets, and this practice developed naturally into bombardment procedures that were placed in effect in World War I.

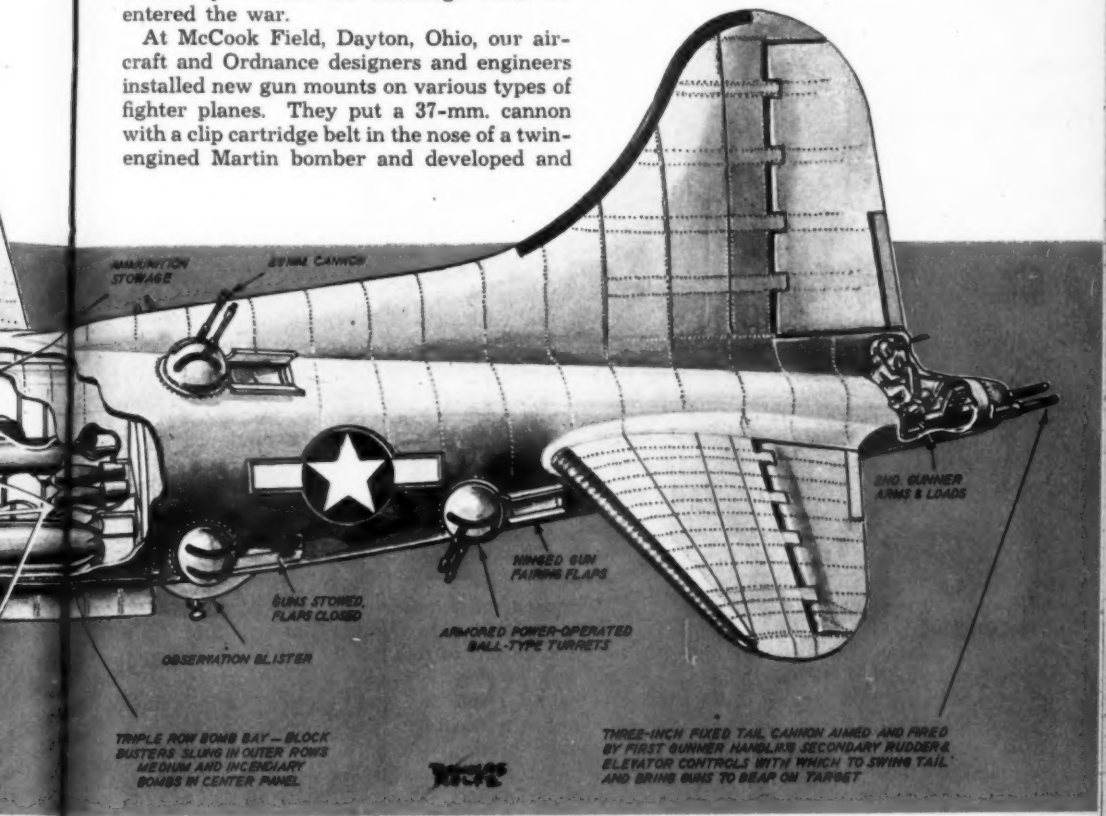
When that war started in 1914, the airplane was regarded chiefly as an observation platform, hung in the sky. From the very moment, however, that enemy airmen stopped waving at each other and began firing at each other, military developments came thick and fast. When the U. S. entered the war in April, 1917, Army aviation, then the aviation section of the Signal Corps, consisted of some 65 officers and 1,087 enlisted men. We had


REMOTELY CONTROLLED WING TURRETS WITH .50 CAL. M. GUNS
FLIGHT ENGINEER AND RADIO COMPARTMENT
NAVIGATION AND GUNNERY CONTROL CABIN
REMOTELY CONTROLLED MULTIPLE 20 MM. CANNON TURRET
PASSAGE WAY
BOMBARDIER
TRAILING AERIAL
TWIN NOSE-LANDING WHEELS RETRACTED
CONTRA-ROTATING PROPELLERS
4,000 H.P. MULTIPLE-ROW RADIAL ENGINES

STRATOBOMBER OF THE FUTURE: On the opposite page, Gen. Arnold forecasts "in the near future" giant new bombers which "will dwarf our present Flying Fortresses." The Army has announced that such a plane, known as the "B-29," is in production, but all details of it are secret. MI has asked Lt. Douglas Rolfe, R.A.F., to design his conception of such a plane as that General Arnold envisions. The above sketch is Lt. Rolfe's conception. His plane has pressurized cabins, wingspan of 180 feet, as compared with the B-17's 103 feet, cannon replacing the B-17's .50 cal. machine guns, and 3-inch guns in the tail. Says Lt. Rolfe: "This bomber is conventional in design and is based on the assumption that any bomber produced at this time will be based upon successful models and only differ in size, horsepower and armament."

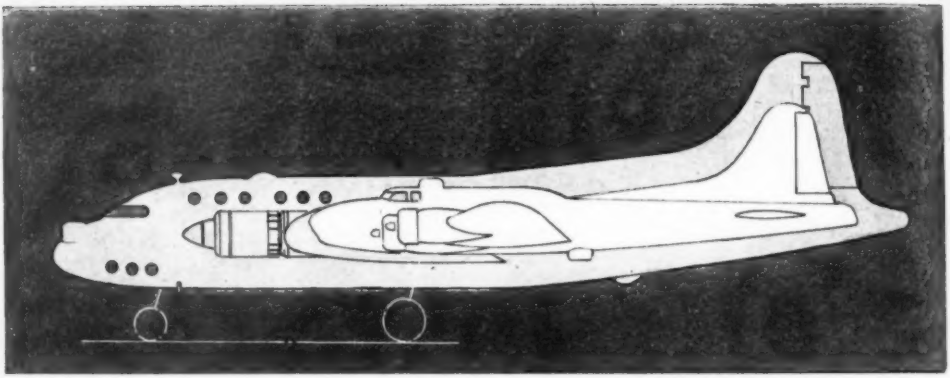
only fifty-five airplanes, and none of them had all the improvements that were being made from month to month on the Western Front. But we went to civilian ranks for our fliers—and got them—and our factories pitched in to build planes, although a scant half dozen had had previous experience. American aviation responded quickly and effectively to meet the challenge when we entered the war.

At McCook Field, Dayton, Ohio, our aircraft and Ordnance designers and engineers installed new gun mounts on various types of fighter planes. They put a 37-mm. cannon with a clip cartridge belt in the nose of a twin-engined Martin bomber and developed and mounted new types of Lewis and Browning fixed and flexible guns, for the guns that had been used were chiefly adapted ground guns. An automatic bomb sight was developed which might have further emphasized the importance of bombing in the last war had it reached the front. Leakproof gas tanks and armor plating were also introduced, but the


AMMUNITION STOWAGE
37MM CANNON
2ND. GUNNER ARMS & LOADS
HINGED GUN FAIRING FLAPS
GUNS STOWED, FLAPS CLOSED
ARMORED POWER-OPERATED BALL-TYPE TURRETS
OBSERVATION BLISTER
TRIPLE ROW BOMB BAY—BLOCK BUSTERS SLUNG IN OUTER ROWS MEDIUM AND INCENDIARY BOMBS IN CENTER PANEL
THREE-INCH FIXED TAIL CANNON AIMED AND FIRED BY FIRST GUNNER HANDLING SECONDARY RUDDER & ELEVATOR CONTROLS WITH WHICH TO SWING TAIL AND BRING GUNS TO BEAR ON TARGET

GENERAL ARNOLD SAYS:

If you will glance into the near future you can see a very different picture than the one of today. The bombers will dwarf our present Flying Fortresses. They will carry half a carload of bombs across the Atlantic and fly home without stop. The bomber's skin will have numerous blisters which in reality will be multiple-gun power turrets controllable from sighting stations. Sights that compensate for almost every possible error encountered in firing on a fast-moving aerial target will control the guns—a sight as revolutionary as our present bomb sight. The plane will have "eyes" that help guide it to its target or warn and plot the course of interceptor aircraft. It will carry bombs of an entirely different design. It may mount heavy-caliber cannon of an entirely new principle of operation. Fighter planes will have advanced beyond recognition in form and in the combat equipment they carry.



A B-17 (shown in white) as contrasted with Lt. Rolfe's conception of the bomber of the future (gray).

war was over before much could be done about their practical application.

Three main types of bombs were developed and used during the last war. Demolition bombs were of light case steel filled with TNT and made in weights of 50, 100, 250, 500, 1,000, and 1,600 pounds. Compared with our present bombs they were deficient in the case strength needed for good penetration. Fragmentation bombs weighed about twenty pounds and consisted chiefly of rejected artillery shells that had been modified. Incendiary bombs weighed about fifty pounds and were loaded with oil emulsion, thermite, or metallic sodium which burned with intense heat for a few minutes upon the explosion of the bombs. There were also 6-ounce miniature thermite incendiary bombs packed in a bomb-shaped container of 100-pound size. This container opened upon release, scattering the miniature bombs.

Up until the early 1920's the Ordnance Department had been responsible for the design, development, and procurement of all armament equipment; that is, guns, gun mounts, gun controls, ammunition, bombs, bomb racks, bomb sights, flares, and pyrotechnic signals. The Department did an excellent job of keeping abreast of the rapid development of airplanes. However, as the airplane began to require more detailed design and to require the gun mounts and bomb racks to be parts of the basic design and airplane structure, it was advantageous to assign the responsibility of all aircraft armament, with the exception of the basic guns, ammunition, bombs, and pyrotechnics, to the Air Corps.

An intense development was begun by Ordnance on weapons solely for airplanes. So, following the peacetime policy of developing quality with the limited funds available and depending on the American mass-production genius to produce this quality in quantity in time of emergency, great progress was made. In 1939 we had an aircraft caliber .30 machine gun that was dependable, adaptable to all types of installations, and could fire 1,200 rounds a minute. But armor plate and leakproof gas tanks made it inadequate.

With foresight, the Ordnance Department had the caliber .50 aircraft machine gun ready for use. This gun weighs only 64 pounds and can discharge up to 800 projectiles a minute at a velocity of 2,800 feet a second. Our present airplanes are literally bristling with these guns. In fighters you will find four, six, and more fixed in the wings or fuselage. It is no small wonder that enemy aircraft, motor vehicles, and ground installations suffer so heavily. Our long-range bombers have been able to accomplish their missions to objectives too distant for our fighters to escort them.

The very low mortality rate of these bombers can largely be credited to this splendid gun.

In all combat theaters our aircraft use cannon varying in size from the 20-mm. to the 37-mm. About 1935, a 20-mm. cannon was installed on an attack ship. Two years later the unique twin-engined pusher plane, Airacuda, was flown with two 37-mm. cannon projecting from its engine nacelles. Then came the Bell P-39 Airacobra with the 37-mm. cannon firing through the propeller hub. This first cannon was a modification of the World War I 37-mm. ground gun, but specially designed light, fast-firing, high-velocity guns are being [*Continued on page* 142]

STREAMLINED SCIENCE MACHINE

by Bernard Wolfe

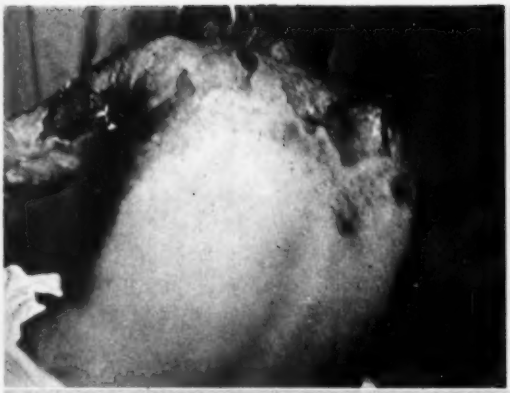
Dr. George Speri Sperti, director of the Institutum Divi Thomae, is one of America's greatest original scientists; holder of patents worth well over $1,000,000 (see MECHANIX ILLUSTRATED, December, 1943). But one of Dr. Sperti's greatest inventions was that of "the science of scientific investigation. The following article, the second of two on Dr. Sperti, discusses this aspect of his work.

Inventor of "streamlined science," Dr. George Sperti.

ON SEPTEMBER 14, 1942, some sixty doctors and physiologists from all over the country were gathered at the Burn Clinic of Loyola University's Mercy Hospital in Chicago to hear an illustrated lecture by Dr. Thomas Walsh. The speaker, an authority on wound therapy, was to present his findings about biodyne ointment in the treatment of burn wounds, showing the progress of each case with photographic slides. What Dr. Walsh had to report would go a long way toward deciding whether biodynes were phenomenal wound healers, holding out new hope to the victims of skin and tissue injuries, or just another laboratory freak. If the results were negative, September 14 was just one more uneventful day on the calendar; if positive, it might very well be recorded in medical annals as the red-letter day on which clinical evidence validated a discovery as breath-taking as salvarsan, Dr. Ehrlich's magic bullet against syphilis.

A startling photograph was flashed on the screen, showing a human leg festered and mutilated beyond recognition, hardly more than a raw, shapeless chunk of flesh. "This man," said Dr. Walsh, "was brought here for treatment eight months after his leg had been burned by molten metal which filled his boot. During his earlier hospitalization he had been given every type of burn treatment—skin grafting, sulfa drugs, cod liver oil therapy—but his leg was still badly infected and he was running a high temperature with many complications. Amputation had been recommended. After four months' treatment with biodyne ointment, the patient was discharged as completely healed." The final slide showed a leg entirely normal in aspect, without any trace of scar tissue.

In the rear of the lecture hall sat a short, stocky man who had slipped in late—Dr. George Speri Sperti, director of the Institutum Divi Thomae in Cincinnati, where the intercellular hormones called biodynes were



Severe burn, before application of biodyne.

Same case, five days after biodyne application.

discovered and isolated. He had come to Chicago to see whether his labors for the past several years added up to anything. He listened attentively as Dr. Walsh summarized the characteristics of biodyne ointment: (1) it gives almost immediate relief to the patient; (2) it is antiseptic, laboratory cultures proving that it has definite germicidal qualities; (3) it promotes the growth of connective tissue and epithelial cells (although it is germicidal, it interferes in no way with the respiration and growth of tissue cells, as most germicides do, but actually speeds up these processes); (4) it not only eliminates scar formation in the great majority of cases, but lessens the period of disability; (5) it does not require the supplementary use of antiseptics, narcotics, or sedatives; (6) it fulfills all the conditions for good surgery and healing. Finally Dr. Walsh came to the case of a person who had been agonizingly burned over a huge area of the shoulders and chest. The last slide showed a complete recovery, with unmarred new skin covering the cruelly scorched body, in a matter of days. "Gentlemen," Dr. Walsh said, "I take a special interest in this case. The patient is a member of my own family."

In the months that followed Dr. Walsh's history-making conference, reports filtered in from other investigators to bolster the evidence accumulated at Mercy Hospital, and to indicate the uses of biodynes in other fields of medicine. Rectal specialists reported splendid recuperative progress in many types of painful rectal complications, thanks to the ointment. Dermatologists found that various skin conditions and blemishes can be cleared up in record time with the preparation. In the field of dentistry, the ointment proved useful for the treatment of dry socket conditions. There was evidence that biodynes can be used in treating the burn lesions resulting from gas warfare and high explosives. Painstaking experiments have shown that the usual run of germicides—iodine, mercurochrome, phenylmercuric nitrate, sulfa drugs —inhibit cell breathing, and that slight amounts of the respiratory-factor biodyne, when added to such germicides, will effectively counteract this tendency, bringing the respiratory rate up to par. This may mean that the germicidal preparations of the future will no longer destroy or devitalize tissue cells, slowing up the inflammatory response and thus impairing the natural mechanism of defense. We may be hearing a good deal about this radical new wound therapy in the months and years to come, as new germicidal compounds, astringents and antiseptics, come into use which have little or no toxic effect on the host tissue. Already a new line of lotions and skin creams, called "SRF" ("Skin Respiratory Factor") is on the market, using biodynes to keep skin breathing up to the norm. Aside from these applications of immediate practical value, biodynes may lead to new understanding and controls in the field of cancer.

Continued

Streamlined Science Machine

Same case, photo taken 10 days later. Eight months later, all scars have disappeared.

"Some years ago," an elderly biologist told Dr. Sperti, "I visited Dr. Ehrlich in the laboratory where he spent all those lonely, obscure years perfecting his cure for syphilis." The two scientists were strolling alongside the sparkling pool at the Bradley Hall marine laboratories in Palm Beach, where all the colorful forms of sea life, from the sea urchin to the man-eating shark, are studied in the quest for new knowledge about disease and its alleviation. Inside the spacious, sunny laboratories, white-frocked researchers and their assistants were hard at work at their benches, each tackling his assigned part in a carefully planned co-operative enterprise. "You have no idea how desperately poor he was. The immortal discoverer of the magic bullet, protege of the great Koch, was so bedraggled and pale, I couldn't help wondering if he got enough to eat. My one ambition then was to work and study under him, no matter what the cost. Finally I summoned up enough courage to propose that I would pay him well for an opportunity to serve an apprenticeship with him. Do you know what his answer was? He looked up at me sadly and said, 'I need the money very, very urgently, but I must refuse. You see, I cannot spare the time from my experiments.' "

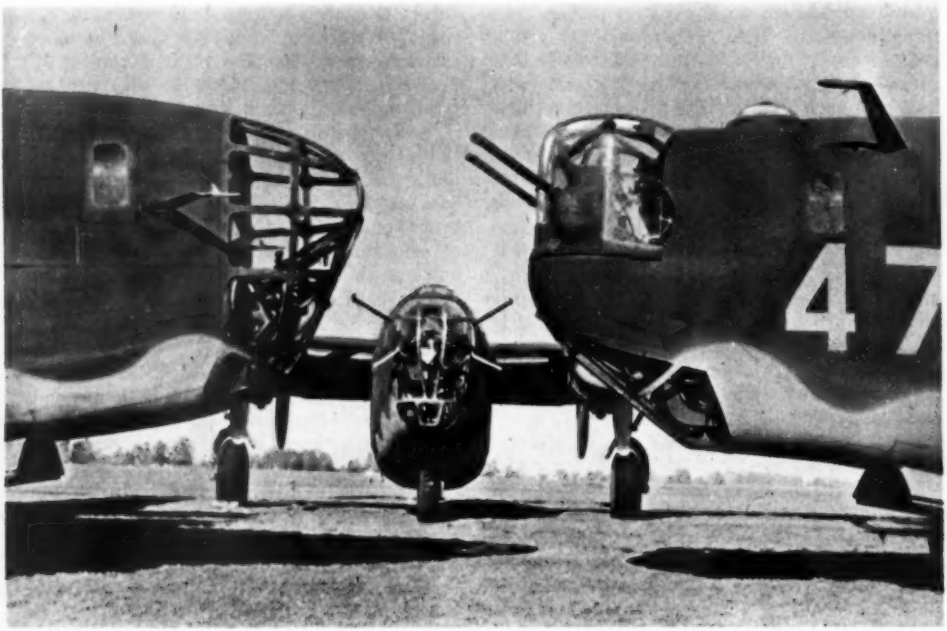
Dr. Sperti, father of co-ordinated research in this country, cites this story as an example of what he has dedicated his life to combatting in the world of science. For twenty years he has been fighting with all his vigor against those who picture the scientist as a lonely, isolated figure huddled over his Bunsen burner in a dingy garret laboratory, content in the martyr-like knowledge that he is serving the world which studiously ignores him. In Dr. Sperti's view, the starveling scientist, rich in ideas but empty of pocket, may cut a stirringly romantic figure in a Hollywood epic, but is downright inefficient in practice. He prefers to cast the balance-sheet of lone-wolf research in cold statistics. "Take a genius like Pasteur or Ehrlich," he says. "Working in complete isolation, he makes two, three, or four major discoveries in his lifetime. With proper facilities, given ample assistance and placed in intimate contact with co-workers in related fields, he may very well triple or quadruple his rate of production—he will make six, eight, ten discoveries. More than that, if gifted novices are allowed to work with him, their later output will be speeded up." Not very many people, Dr. Sperti believes, realizes that there is a science of scientific procedure and investigation as exact as the discipline of mathematics.

The Institutum Divi Thomae, in Cincinnati, is Dr. Sperti's answer to the dilemma of Ehrlich and other solitaries in science. It is a fellowship of crack scientists, based on the principle of co-ordinated effort. In the eight years since it was founded, this graduate research center has built up a staff of 125 top-flight specialists in the various branches of research, wtih affiliated units throughout the country.

A detailed set of rules for co-operative research has been worked out at the Institutum. First and foremost is the tenet that every scientific mind must be encouraged to function on all cylinders—a man capable, say, of organizing a whole staff to investigate a major cancer problem [*Continued on page* 146]

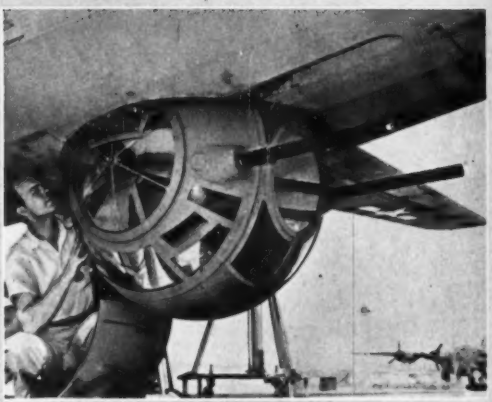
THE LIBERATOR

THE Consolidated B-24 has been a step-child plane to the Flying Fortress insofar as publicity has been concerned in this war—largely because the Fortress was first out and in action. But its exploits in the Pacific and in such daring raids as the one on the Ploesti oil fields of Rumania have made it the B-17's equal in public favor. Newest model, shown here, has power turrets in nose and belly and a total of 13 guns. The Liberators have a greater wingspread than the Fortresses but a shorter body. Both have a cruising range of over 3,000 miles. The Libs, while bulkier in appearance, are considerably lighter.



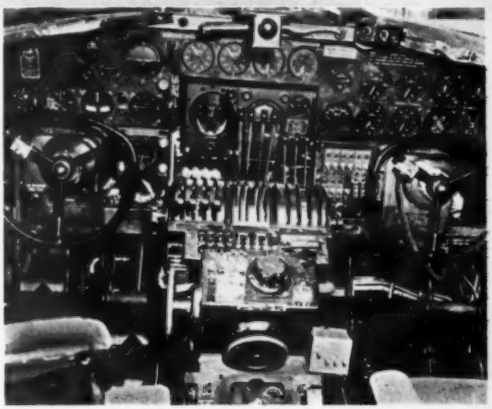
First model of the B-24 (left) had but one gun in the nose. Second model (center) had three "toggle" machine guns. Latest model (right) has two electrically powered guns. These new frontal killers fire together.

Here is a closeup view of the B-24's new twin machine guns in their electrically powered turret.

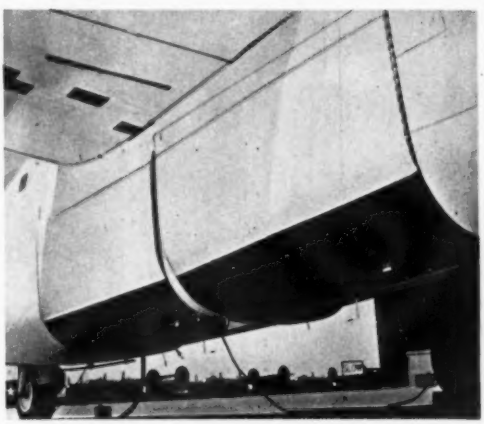


And here is the B-24's new Sperry ball turret for plane's belly. The turret is fully retractable while not in use.

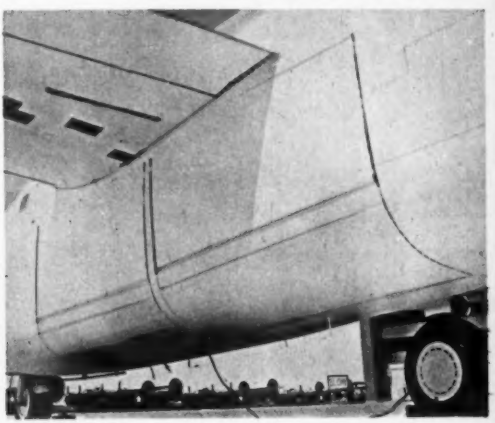
This is the 24's Consolidated-designed tail "stinger" guns. The Liberator has four turrets and five fixed guns.



Here is the Liberator's panel board—also known as a "pilot's nightmare." Dials grouped according to use.



B-24's bomb bay doors slide open like a barn door.



Here are doors closed. White B-24 used by English.

LAZY INVENTORS

BUT THE AFRICANS ARE SMARTER THAN YOU'D THINK!

by
Commander Attilio Gatti

LOOK at the average African native. "The poor wretch," you say. There he is, sunk in the depths of savage barbarism, surrounded and ambushed by merciless monsters, lost in the middle of a treacherous world of arid plains, pestiferous swamps, impenetrable jungles. "How can he survive?" you ask yourself incredulously. "And, even if by some miracle he does manage to survive,—what forlorn, miserable, infernal existence he must go through!"

This, at least, was the way my thoughts ran when, some twenty-five years ago, I started my first African *safari*. But, believe me, it didn't take me long to change

Jungle and elephants furnished the material for two of Africa's most inspired inventions. A Ubangi mastermind used wood to stretch his wife's upper lip, as shown at left—for a reason more unusual than you could imagine! And a Zulu used elephant tusks (right) to make musical horns for an even more subtle reason.

my ideas. Radically, too. And today,—after having spent fourteen whole years on African soil, while leading ten long scientific expeditions into the darndest, most god-forsaken regions of twenty different colonies—I can assure you that nothing could be more false than that "poor wretch" business.

True, African natives have no factory, no shop, no money, no writing. Except for the few who live near white settlements, they have no means of transportation or communication supplied to them, no ready-made weapon or medicine with which to protect themselves, no tool or organized sources of supply from which to expect assistance.

But, do they worry about it? Not in the least. What nobody is there to give them, they create. What can be bought no place, they make. Whatever their needs and tastes call for, they simply conceive, devise, discover or invent. With such ingenuity and imagination, by such mechanical resourcefulness and deftness of craftmanship, as to leave you spellbound. Especially when you come to the conclusion, which I have long since reached, that not only their wants are amply satisfied with a minimum of effort and labor, but also their physical comforts, their mental pleasures, their artistic luxuries. With the result that, on the whole, they are the most self-sufficient, the happiest and merriest people I have met during my extensive travels in five continents.

Take the Zulus, for instance.

Before reaching their secluded mountainous territories, you must go through the South African city of Durban. There you see the first specimens of that race which once, under King Chaka, conquered and dominated most of the Transvaal and the surrounding countries. Those first Zulus you encounter have a lowly job. For a few pennies, they taxi you around the city in their two-wheeled rickshaw. But not for that do they feel abased, humbled or dependent. On the contrary. To attract your attention and your patronage, out of cattle horns, ostrich eggs, feathers of big game birds and discarded bits of colored material, they make up striking costumes and the most theatrical headdresses. Once you sit in their rickshaw, they are not content with the steady trotting you expect from them. For your entertainment, and their own pleasure, they break into a gallop,

they rear, kick and leap, like so many young horses too full of oats.

Up in the mountains, you find another kind of Zulus. Those are a pure, proud, beautifully built people. In their territories, almost entirely barred to the white man, they live the unspoilt life of their forefathers.

The country is cold, damp, swept by furious winds. And the Zulu has no way to obtain clothes, no forests from which to get an abundant supply of trunks to build shelter with. But he has his cattle and plenty of grass. Out of the former's hides, he makes garments for his women, hard shields for himself. With the latter, and a few sticks, his women build the most graceful, cold-proof, wind-resisting huts you have ever seen. And you should hear the sweet music produced by the harp his girls put together out of a long reed, a creeper and a dried calabash.

Out of rare ironwood and the precious iron that some of his sorcerers know how to melt, the Zulu warrior makes his assegai. It's a mean-looking spear. But of what good would it be against a

A calabash, a creeper and a reed, and—presto!—you have a sweet harp (and it's NOT a violin, as you might believe).

Continued

Lazy Inventors

The middle stalk of a banana tree is a conglomeration of moisture cells. It makes a perfect water-cooled pipe.

colossal monster such as the python which infests Zululand? To give you an idea, I once killed one exactly thirty-six feet seven inches long. No kidding,—its skin is still preserved in the Pretoria Museum. When I found that python it was wound around a huge bull. I shot once, aiming at the snake's head, and blew it up almost entirely. Yet, its muscles contracted and the bull was crushed. I shot again and again. But it took half an hour before the serpent stopped whipping and lashing the ground.

Formidable as the beast is, the Zulu has discovered and developed a secret, still unknown to the white man, by which he utterly dominates it. If only he can reach a propitious position, out his hand shoots. Swiftly, his thumb and forefinger apply a certain kind of pressure at a point just behind the head of the python,—and the huge monster goes limp, as if paralyzed. And it remains absolutely harmless for hours, giving the Zulu's assegai a chance to go to work at the proper place, and to dispose of the frightening foe.

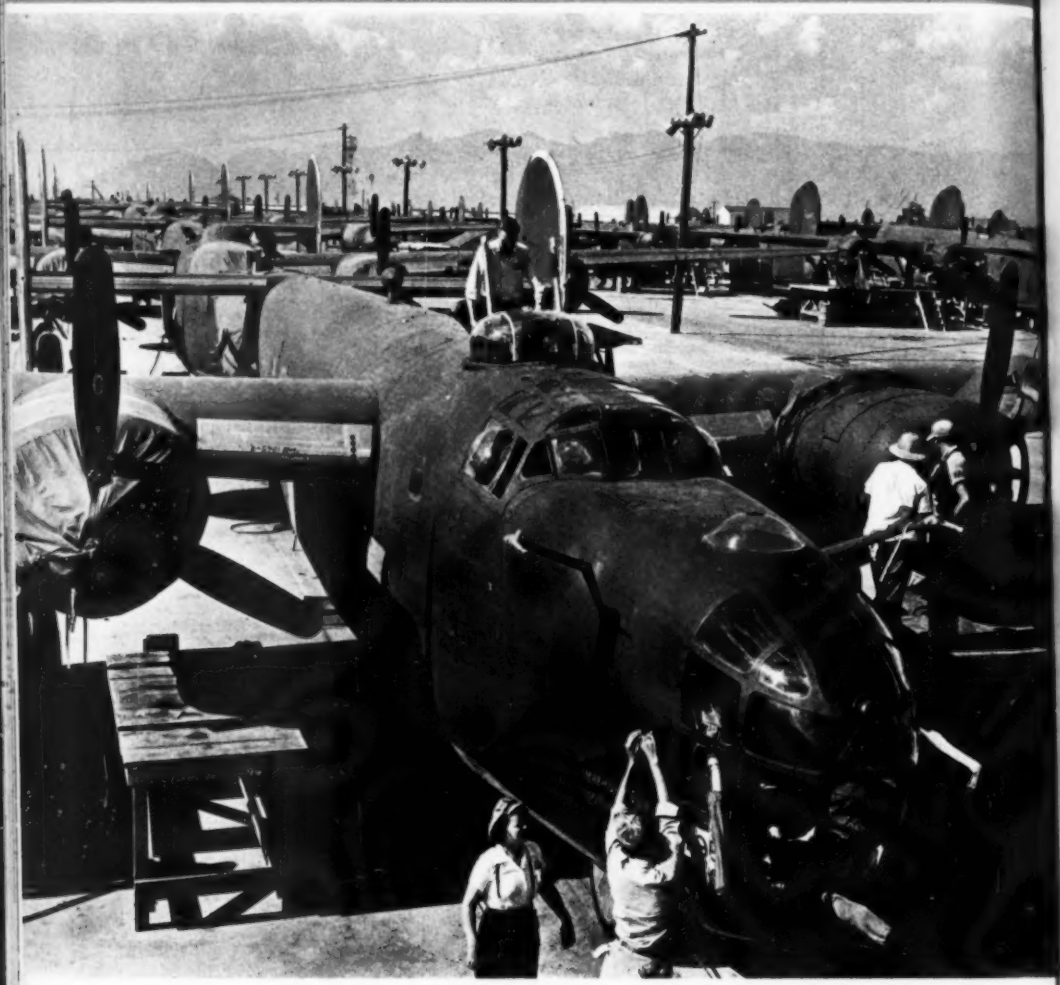
Charlie, as we called [*Continued on page* 149]

Africans have made some weird discoveries in herpetology. Charlie, the author's chauffeur, shows how to pinch a python.

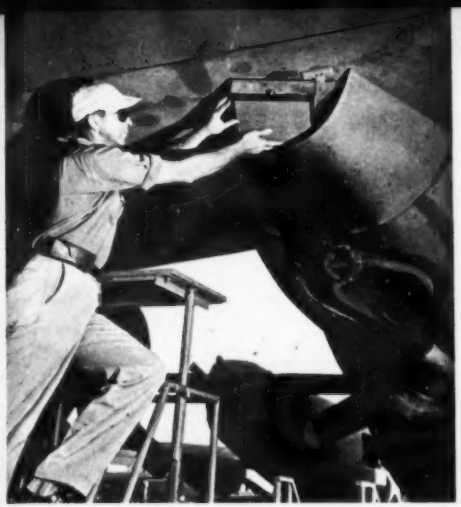
The Zulu is the perfect "lazy inventor." In a land almost totally closed to whites, he lives a happy, contented life, completely self-sufficient.

TAILOR SHOP FOR BOMBERS

by Alfred Eriss



THE Tucson Modification Center (above) is one of the Air Forces' cow pasture miracles. The great and deadly Liberators are flown from parent plants to this converted pasture for last minute changes to cope with special mission needs or to gain an edge in combat over enemy aircraft. Our combat airplane production is actually determined by the output of the network of modification centers which dot the country, not by the parent plants. At first, after the fateful Dec. 7th, these dispersal areas were simply lounge-areas for refugee aircraft—to do away with the "beautiful" targets the bombers made when clustered around their parent plants. Now the Centers have gone to war. Their watchword is flexibility—make numerous needed changes in the field to spare production lines the wasteful delays of retooling; keep standard models from reaching a stage of obsolescence due to enemy fighter plane improvement.



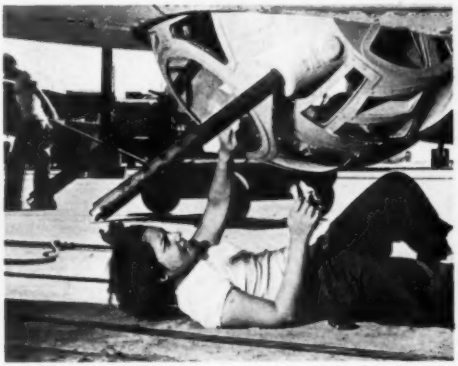
AT THE rear of a mighty Pratt and Whitney engine, a workman installs the "dust catcher" which will help lengthen the life of the engine in combat.

AN ALTITUDE MUST is oxygen. Here workers of the Tucson Division complete installation of main oxygen tanks. They feed various personnel spots.

ON THE line, all loose equipment which must be removed for easy access to the plane is stored in racks placed atop the Liberator's huge wing.

WITH THE B-24's leaving for far flung fronts, extra bomb bay tanks are installed which can be dropped when the ship reaches its destination.

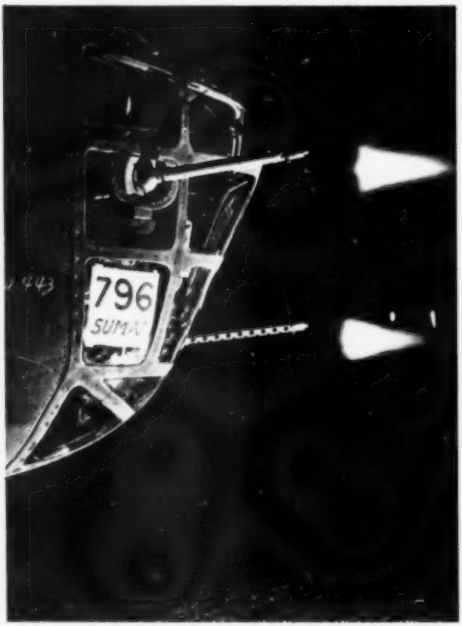
A PROTECTIVE covering for the guns of a bomber's top turret is put on by a Center workman against the backdrop of a brilliant Arizona sunset.



FULLY retractable turrets being installed in the belly of a bomber. At the last station of the line, the ball turret gets its final glass panel polish.

WITH A .50 caliber nose gun in place, a workman installs the sight—puts the loading racks in properly —checks the machine gun for proper movement.

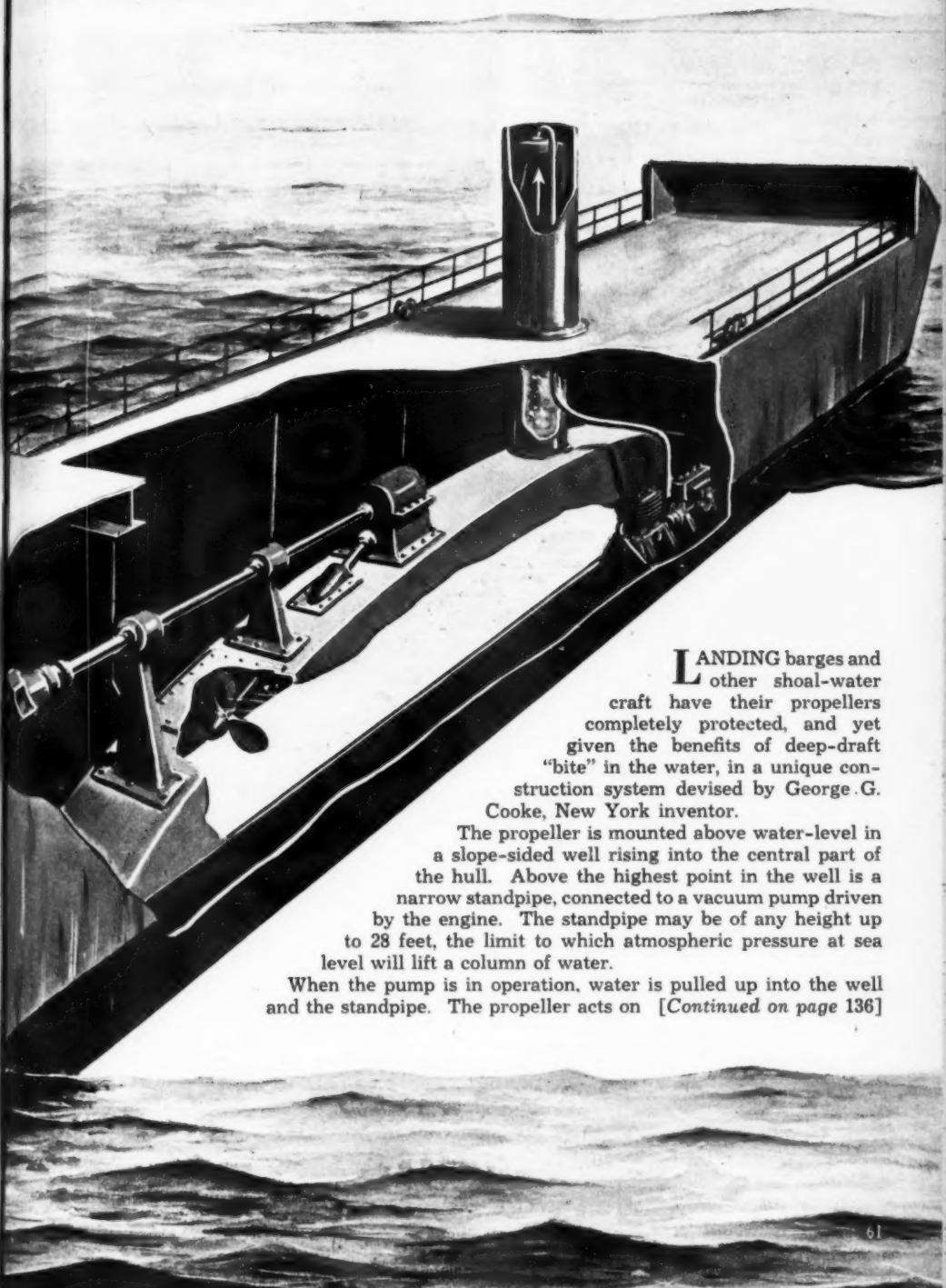
CREWS IN combat brought about the change which modifies the position of one of the nose guns. Note the mattress used as a workman's sunshade.



EVERY gun on each ship is test fired at the Tucson Division firing pit. The towing tractor's headlight illuminates two nose guns spitting fire.

A DE-ICER boot comes off one of the twin rudders of a Liberator. Operational needs find the cow pasture mechanics skilled and ready upon notice.

VACUUM-DRIVE PROPELLER



LANDING barges and other shoal-water craft have their propellers completely protected, and yet given the benefits of deep-draft "bite" in the water, in a unique construction system devised by George G. Cooke, New York inventor.

The propeller is mounted above water-level in a slope-sided well rising into the central part of the hull. Above the highest point in the well is a narrow standpipe, connected to a vacuum pump driven by the engine. The standpipe may be of any height up to 28 feet, the limit to which atmospheric pressure at sea level will lift a column of water.

When the pump is in operation, water is pulled up into the well and the standpipe. The propeller acts on [*Continued on page* 136]

YOUR POST-WAR AIRLINE JOB

by John Barnes

Will Air Force pilots and mechanics be equipped to take over top commercial airline jobs when the war is over? Are the skills required in both fields that similar? What of the traffic man?

HUNDREDS of thousands of American men are receiving aviation training today in the Army, Navy and Marine Corps air forces. A great many of these young men plan to go into commercial aviation after peace is won. What must these men do to win a place in post-war aviation? Can they expect to step out of their combat planes into an airline pilot's seat?

With all due credit to our magnificent service training systems, it is only fair that these young men should know now what to expect of aviation after the war. These men are receiving by far the finest training of any combat fliers in the world. They are, without doubt, the world's best combat pilots—for there seems to be something in the American way of life that produces great pilots.

Why then won't these pilots and mechanics of our air forces be able to step in and immediately do a fine job for the arilines when the war is won?

They won't for two reasons. Number one, they will have been trained chiefly for combat and not for commercial operation. Number two, there will have been engrained into them a different concept of their job.

The ultimate objective of all air force training is the successful completion of a mission, whether it be bombing, strafing, or shooting down the enemy aircraft that oppose you. The safety of the personnel involved, or of the equipment itself, is of secondary consideration.

The ultimate objective of all airline training and operation is safety.

The two types of training, and the two concepts, are incompatible in that respect. Let's take the case of the pilot, the mechanic, and the ground force man each in his turn.

Number one, the pilot. The Air Force pilot must have daring; he must be willing, when the operation warrants, to take unheard of chances. The very thought of "daring" and "unheard of chances" is enough to make the chief pilot of an airline shudder and have nightmares when he goes home at night.

Mr. George K. Rice, Chief Pilot of Transcontinental and Western Air, Inc., has expressed the opinion of the airlines concisely. "First," he says, "we have a job to do. We must win the war. But after the war we must teach caution to those combat pilots who come to us looking for a job."

In that one word, CAUTION, lies the crux of the matter. If the USAAF attempted to operate cautiously, the war would be lost be-

Army bombers were expendable in the Ploesti, Rumania, raid. Daring tactics were the order.

ALL THE TIME that a bomber pilot exercises when he is making his run over a target, holding his course within a degree and his altitude within a few feet. For that few minutes the bomber pilot becomes the precision pilot that the airlines want. But after the bombs are dropped, the pilot of a Flying Fort gives not a thought to precision flying, his main purpose is to get home as fast as he can "git." The very thought that he should fly for hundreds of miles as he flew over the target would be foreign to him. And it should be. He's a combat pilot.

An airline pilot is required to be able to fly on instruments with precision. Instrument precision flying in the Army Air Forces would be an unheard of requirement, not because the generals wouldn't like to have it, but because of the lack of time. It would take many months of extra training in instrument flying alone to produce the instrument pilot the airlines have to have, and the exigencies of war do not allow for this additional training.

But 100% safety of airline operafore the year is out if the airlines attempted to operate without caution and safety always in mind they might as well go out of business tomorrow for they would lose the confidence of the public upon which their continued operation is entirely based.

So much for the Air Force pilot's concept of his job. What of his training? His training is excellent, but it isn't extensive enough to satisfy the safety rules of the airlines. He must be started out as a co-pilot and trained hard in airline procedure and flying for a couple of years.

One of the things of which the Army Air Force is most proud is its precision flying, but it is of an entirly different type from that needed by the airlines. Precise formation flying and excellent acrobatics have no place in commercial flying. What the airlines require is the type of flying

Caution. Safety are the watch-words of commercial airlines. Here T.W.A. trains two Army men as these war-time needs demand.

tion, which is carried on in all kinds of weather does require this most exacting technique. You must be able to ride a radio beam right on course, locate a cone of silence precisely, and then make a standardized instrument approach to the field, with a 500 foot ceiling and a one mile visibility, so that you know exactly where you are every minute of the time just as if you were making the approach to the airport in perfect weather.

As an Army Air Force pilot your lack of training precludes you from knowing many of these things. Part of the training, of course, overlaps, such as knowledge of manifold pressures and the operation of your instruments and engines. But that part that deals with routes, distances, approach procedures, terminals, and precision flying on instruments does not overlap. And it takes a longer time to learn such things than you think.

As a combat pilot you will be valuable to the airlines, but not as captain with the safety of twenty, or forty, or sixty passengers entrusted to you. You will be valuable to them as excllent rough material only. So after the war, if you are a combat pilot and you want a job with the airlines you better stick your pride into your back pocket before you walk into the Chief Pilot's office, and despite your probable 5,000 hours of four engine time, be prepared to say: "Yes, sir, I'll take a co-pilot's job, and be glad to, until you think I know enough to be captain!"

Number 2, the mechanic. The same thing applies to the mechanic as applies to the pilot.

War is waste on a grand scale. And especially with the Army Air Forces in the field attrition is very high. In other words, an airplane is not operated very many hours before it is lost—either being shot down, or cracked up in landing on poor terrain, etc. The Army Air Forces maintain their airplanes in the same top notch condition as the airlines, but by a different method. Two airplanes will come back from a bombing mission badly shot up. They won't attempt to repair both airplanes. If two airplanes become worn out through intensive use, they won't attempt to rehabilitate both. They will take the best from the two aircraft involved, add any necessary new parts and have as the result one good airplane again.

The airlines can't operate that way. Mr. Ray Dunn, manager of TWA's Technical Training Division, smiles at the very thought that they could. One of his jobs is to train army mechanics. Like Mr. Rice, his major concern is to win the war as fast as possible, and he is training mechanics for the army the way the army has to have them trained, fast and in quantity, to get the job done. But as an old airline man he shudders at the necessary waste in the Army Air Forces. "If we operated an airline like that," he says, "we'd go broke in six months."

The Air Force mechanic knows how to make certain emergency repairs, and if those don't work, to install an entirely new part, but he does not know how to take that damaged part into a splendidly equipped radio, instrument, or machine shop and make it as good as new again.

There is one example on record of a mechanic in North Africa making a brand new condenser out of a tin can and succeeding in starting the engine that way. Such ingenuity should be, and was, rewarded. But can you imagine an airline needing such ingenuity? What they need is not ingenious emergency measures, but shop skill of a very high order.

Number 3, the ground man. The Traffic Department of an airline, which in-

[*Continued on page* 151]

Army mechanics can be trained now for precision repair work in splendidly equipped shops.

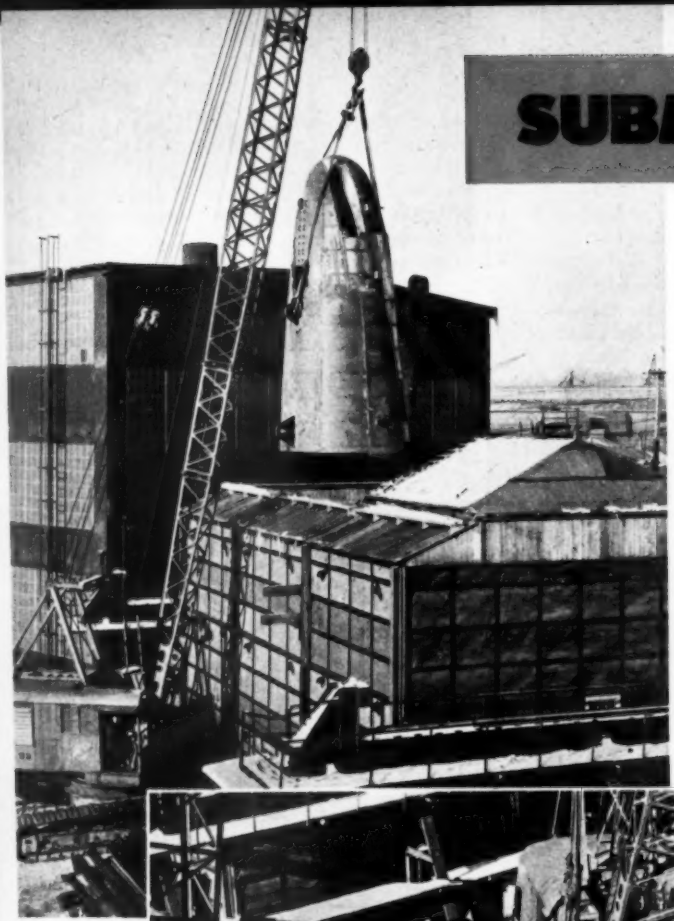
FLIGHT SPY

THIS device is an adaptation of the theodolite principle used by North American Aviation to check air speed calibration of experimental planes. It's a viewing frame for following a moving plane, equipped with pencil and graph paper. Through a 20-cent telescope lens the observer follows the plane as it flies past the observer several times at the same altitude. A solenoid switch breaks the circuit every quarter of a second, deflecting the pencil upward for time measurement. The observer also gets a temperature reading. With this, plus altitude check on the graph and air speed meter reading of the plane, the true air speed is calibrated. Lou Waite, the adapter of the cleverly simple device, says it is home made except for the solenoid switch box on the platform.

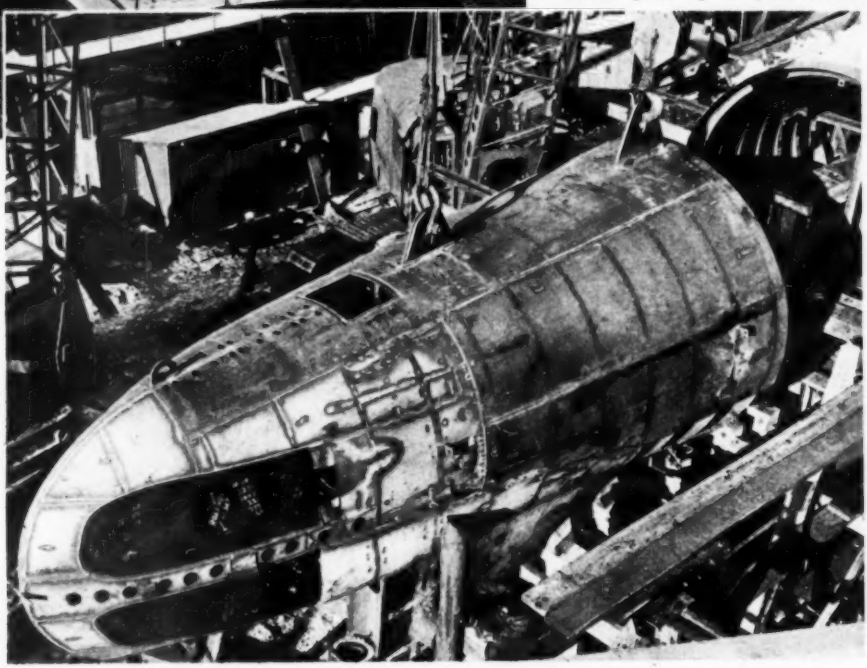
A B-25 Billy Mitchell bomber takes off (above) followed by the theodolite, and returns to fly over the field at a given altitude. At the left, the observer then gets a temperature reading.

SUBMARINES

WISCONSIN was noted before the war for its dairy cattle and cheese. But now submarines are pouring from the dairy farms of the Badger State. These pictures show the manner in which the Charles C. West Co., at Manitowoc, Wis., has applied Henry Kaiser's shipbuilding methods to the inland construction of submarines. Working from a full-size wooden submarine which was first constructed as a mock-up guide, the yards build subs in 15 separate sections, slap them together by cranes and weld them into a complete ship. Subs are launched in Lake Michigan, floated down the Mississippi in a drydock.

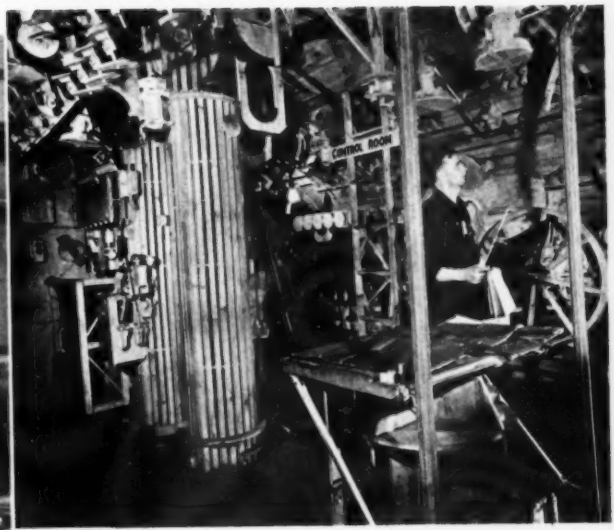


Submarine stern section is swung across yard by a giant crane.



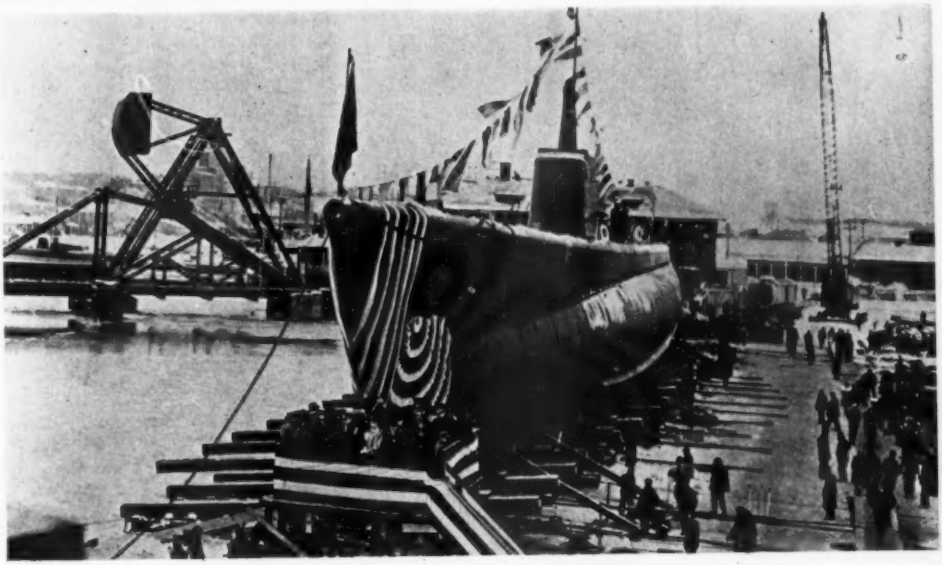
The stern section now goes into place beside the sub's mid-section, to be welded.

FROM DAIRY FARMS



Above: Ever see a wooden submarine? This the interior of full-sized wooden sub built to be used as a model.

Left, two sub sections are welded together. Technique used is similar to that employed in Liberty ship work.

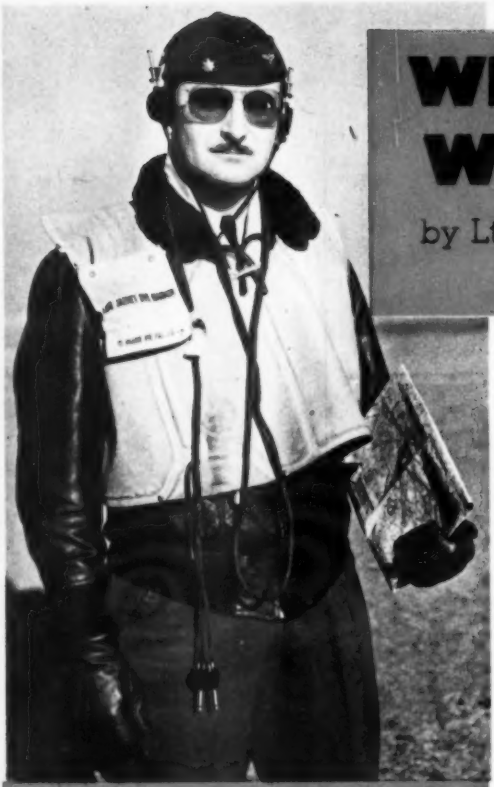


And there she goes! A sub built on a dairy farm 1,500 miles from an ocean!

WE FIGHT THE WOLF PACKS

by Lt. Commander E. J. Suydam

as told to Michael Stern



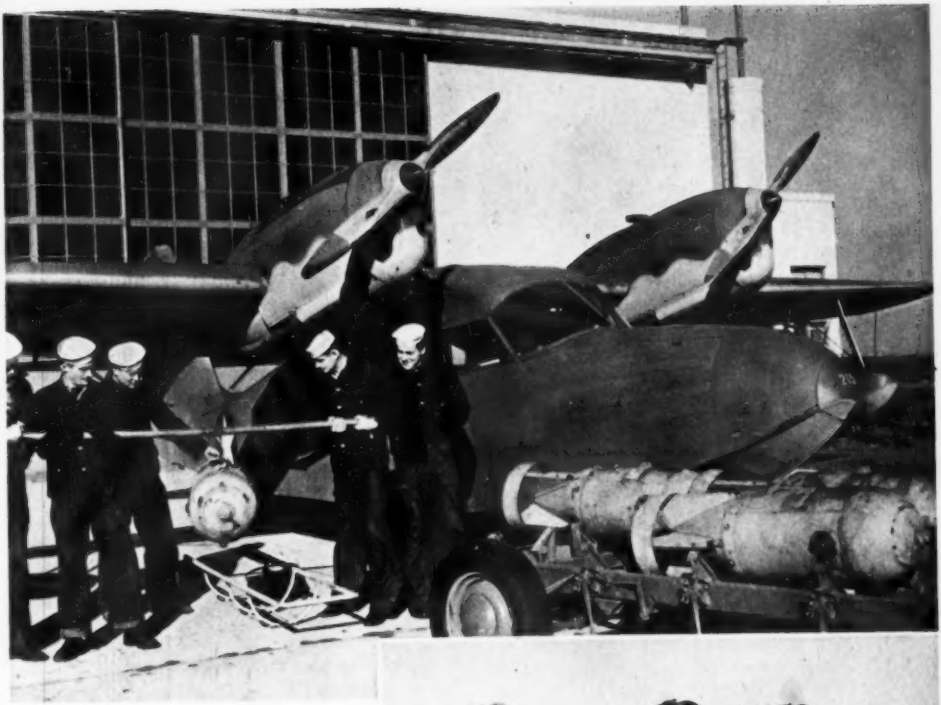
Lt. Commander E. J. Suydam, Commander of an Eastern Coast Guard Flying Patrol Station.

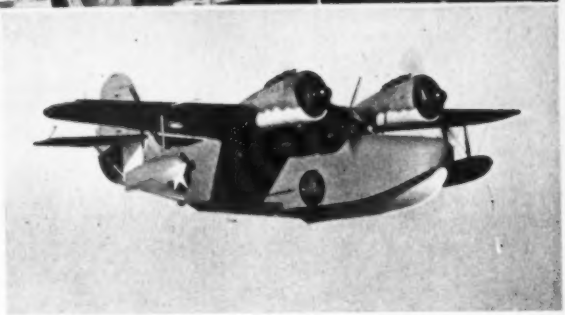
THE J4F amphibian bucked a heavy headwind. Far below long lines of a convoy rolled the heavy surf on its way to England. Even from this height the pilot, Ensign Henry White of the Coast Guard air arm, could see the sparkle of the ships' ice-coated decks in the cold winter's sun. Speedy destroyers cut through the heavy seas, green water shipping over their bows as they ranged the flanks of the ships they protected.

Flying to a fixed point the pilot put the J4F into a clipper turn for home. This was a routine patrol flight for the highly maneuverable Widgeon, a name given the fictional hybrid resulting from the cross-breeding of a duck and a bird. The Widgeon looks like a duck, but she flies like a bird.

The plane cruised at five thousand feet as it

A Coast Guard patrol plane picks up the survivors of a U-boat sunk off the East Coast, as blimp hovers.





Above, a Grumman "Widgeon" being loaded with depth charge bombs. At right, a sister ship, the JRF "Goose," as pictured on MI's cover.

headed for its home base. The pilot and Radioman Bogge scanned the endless ocean in all directions. Both men at the same instant saw the conning tower of a U-boat break the surface of the shimmering water. A moment later the entire deck came into view.

"Well, what do you know," Bogge said.

The pilot didn't answer. His mind was intent on his work, but his lips hummed: "Happy days are here again."

It was the sort of sight a Coast Guardsman dreams about, but rarely sees.

The pilot, banking the Widgeon, headed on a straight course for the sub. As he moved in for the kill he radioed an abbreviated code message to the base. They were only two miles off now and White saw that she was one of the new U-boats, the large kind, with a long cruising range. He hoped to be able to slip in and drop his depth charges before being spotted, but someone on the sub saw him and it went into an immediate crash dive. Ensign White quickly shoved the stick forward and nosed the Widgeon down. This little ship is a jack of all trades who has done many things in her day. Today she was called upon to be a dive bomber. The wind screamed through the struts as she roared down at the rapidly disappearing sub. It was a punishing descent for the sturdy little plane, but she took it in her stride.

A Widgeon does not carry a bombsight. Its depth charges are aimed with the naked eye. A Coast Guard pilot doesn't like to waste good ammunition so he does what Henry White did in this case. He shot down to one hundred feet and, just as the sub's periscope slid under water, pulled on the release and let go the pair of lethal ashcans carried under the wings. They fell on that spot

An injured seaman being transported in a Coast Guard rescue plane, after being picked up at sea.

in the water where the submarine had disappeared.

White pulled back on the stick with all his strength, strained to pull the Widgeon out of her sharp dive. The ashcans exploded with a thunderous roar and a pair of gigantic geysers shot skyward. He nosed the ship up to three hundred feet, cut his cruising speed and circled the spot where the explosion had taken place. As soon as the eruption subsided he saw large bubbles of air break the surface of the water. Heavy oil came up forming a slick. Debris also came floating to the surface. There could be no mistaking the results of the attack. The Widgeon had mastered another German undersea raider.

The Widgeon was never meant for war, although she has taken to it like a duck—remember she is part duck—takes to water. The original purpose of this Grumman amphibian was to serve as a mercy ship. That, and to perform the many small jobs that only a lightweight, fast, sturdy and highly maneuverable aerial jeep can perform—tasks that have made her literally the work horse of the Coast Guard.

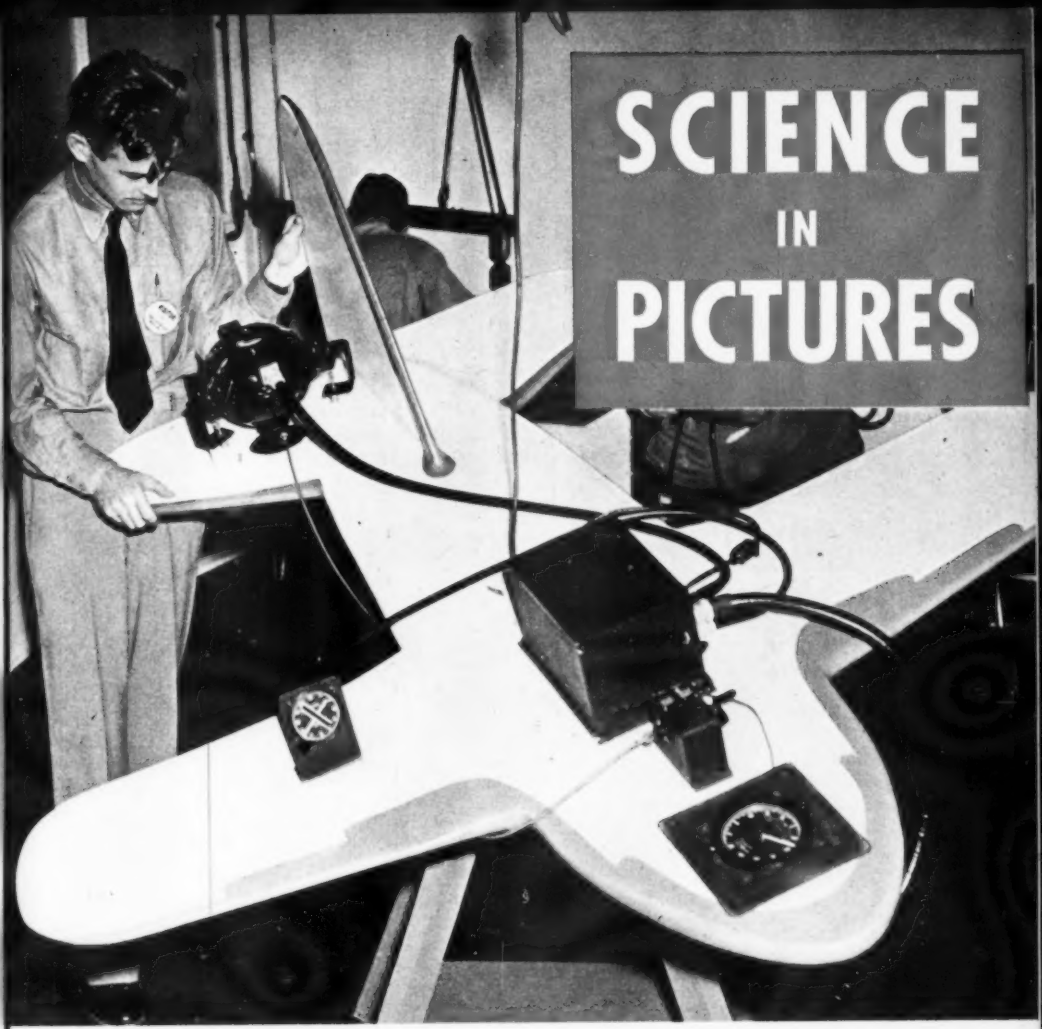
There are very few jobs the Widgeon cannot perform. She can even fly on one engine. Ensign S. R. Graham found that out. He was flying along on anti-submarine patrol at less than five hundred feet when one engine suddenly went dead. The pilot immediately radioed his base at the Floyd Bennett Field in Brooklyn, jettisoned his depth charges and worked frantically to make engine and flying control adjustments. Amazingly enough, the Widgeon not only flew, but gained altitude. As Graham reached the home base crash boats stood by for instant action, but the pilot "greased her on" as beautifully as though both engines were working.

It is in the field of war rescue work at sea that the Widgeon stands supreme. It was a bitterly cold day this past winter with the base thermometer reading five degrees above zero when an army flier, forty miles off shore in the Atlantic S.O.S.'d that he was about to crash and radioed his position. Then there was silence and we knew that he had either parachuted free of his ship or had crashed with her. We knew that we had to work fast because no man can survive long in that frigid water. The chart in the operations office at Floyd Bennett Field showed that we had a Widgeon aloft, piloted by Lieutenant R. J. Lafferty—he has since been killed on a combat mission—who was due back at the base after an afternoon flight in search of survivors and bodies following the collapse of a bridge somewhere on the Eastern seaboard. Lafferty's position could not be far from the army flier who had just gone down. He received our radioed message, nosed his ship around and winged toward the point from which the S.O.S. had been received. Within five minutes he spotted a collapsed parachute floating on the ocean. There was no sign of the pilot. In spite of a rough sea he zoomed the Widgeon down and landed her with the ease of a bird.

Radioman Harold Klemm climbed out of the cockpit, reached into the water and grabbed up a fistful of parachute silk. He hauled in on it, found that the shroud lines were tied to something heavy and yanked frantically. The head of the unconscious pilot came out of the sea.

Lafferty climbed out of the cockpit to help his radioman drag the unconscious man onto the Widgeon. The freezing wind stabbed like daggers at hands and face. In spite of the torture inflicted by the weather, Klemm stood in the open bow hatch and administered artificial respiration to the victim. Within a few minutes Klemm's wet fingers were curled out of shape and so badly frozen that he couldn't close them. [*Continued on page* 140]

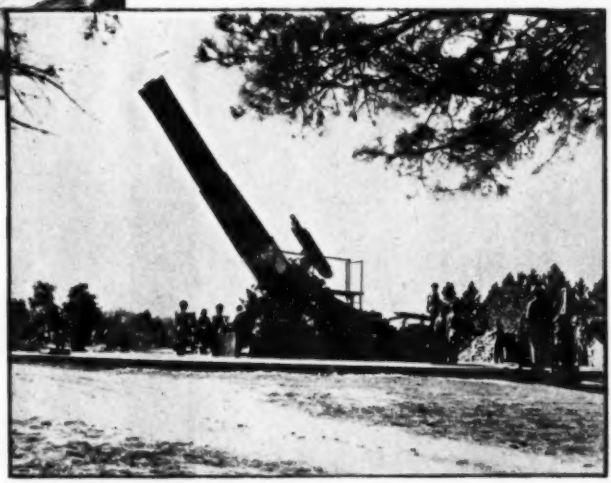
SCIENCE IN PICTURES



HERE is the Gyro Flux Gate compass. It's the second new compass to be invented in more than 4,500 years. Charles Marcus, vice-president in charge of engineering at Bendix Aviation Corp., said: "It's as great an advance over the conventional magnetic compass as that compass was over the lodestone." The marvelous new instrument will not go off its reading when a plane dives or climbs; will not lag or overshoot during a turn; will not oscillate or "hunt" back and forth during rough weather. This is particularly noticeable in the polar regions, where conventional magnetic compasses go "haywire." So said W. A. Reichel, director of engineering at the Eclipse-Pioneer division of the Bendix Corp.—where the research and development of the compass took place. The device uses the earth's magnetic field to develop electrical impulses which, when amplified, move the compass indicator. "Flux gatè" means the reception and rejection of the magnetic flux from the earth. An advantage of the new compass is its elimination of the "correction card" necessary with magnetic types. It gives its own corrected readings at all times. The transmitter can be placed at a distance from the indicating dial to prevent being affected by bomb load, armor plate, etc., that impair accuracy of other compasses. Pilot, co-pilot, bombardier, navigator—all can have a compass dial; there can be as many dials as needed. A gyroscope spins at 10,500 r.p.m. to keep the flux gate horizontal. Shown above—compass transmitter (upper left on plane's tail). Amplifier on center of "fuselage." Master indicator on plane's nose. Secondary indicator on left.

Flying Leeches

SOMETIMES the Air Express Division of Railway Express Agency totes strange cargo. At left, Charles Yacobellis, the Leech King of Long Island, N. Y., prepares a container of live leeches to be rushed across the country by air express. Leeches are perishable in transit unless kept cool and moist. Immediate delivery upon arrival must be assured. Packed in wet moss and shipped by air, they arrive in good condition. Up to 300,000 leeches a year are imported from Portugal and reshipped to drug companies and laboratories throughout the U. S. and Canada.



For Our Defense

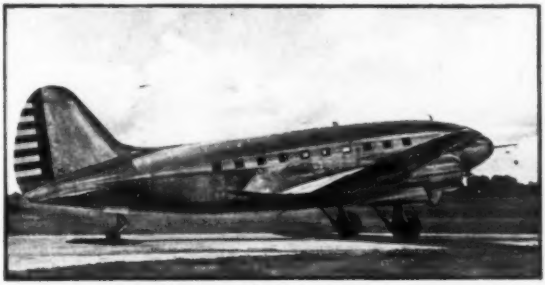
WITH the Allies so much on the offensive, it is natural that the spotlight is cast on airplane and warship guns, rockets and torpedoes—weapons that take the fight to the enemy. But this is a mighty, 16-inch howitzer of the Coast Artillery that can belch 2,100 pounds of armor-piercing shell a distance of twenty miles for our defense. Here it raises its massive barrel in defiance.

Invasion Ramp

TO THE left is the Landing Ship Tank that carries its own roadway for use when it can't come in close enough to shore to unload its cargo of men and material. This roadway, or pier, is carried on the side of the LST and is put into place in a few minutes. One ramp can serve many landing craft. This photo was taken at Licata, Sicily, as an LST poured out its load onto its own roadway. Turn to page 77 for a beached LST.

Pincers Punch

A "PINCERS MOVEMENT" is executed by this machine in punching 13 holes at one time in these plastic helmets which the Westinghouse Electric and Manufacturing Co. is making for the Army. The holes are pierced to allow for riveting of chin strap, neck band and hammock to the helmet. Made of Micarta, a tough plastic, the helmet is the liner or inner half of the Army's two piece steel and plastic headpiece. Although they weigh less than 12 ounces and are made of cloth and resin, the plastic helmets are tough enough to withstand the impact of an 8-pound steel ball dropped from a height of nearly 2 feet. This worker uses a vacuum-cup holder to place the helmets in the press, thereby safeguarding her hands and speeding up the operation. Axis bean-ball throwers please copy.



Higgens Does It

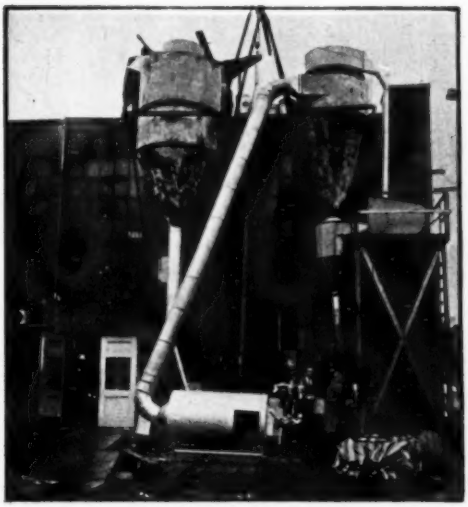
IF UNCLE SAM wanted a super rocket to fly men to the moon, no doubt Andrew Jackson Higgens would take a crack at building one for him. The famous New Orleans ship builder, the man who turns out little boats in such a big way, has now branched out into the aircraft industry. At the left, top picture, is his prize item—a helicopter, designed and being built by Eneas Bossi, a naturalized American who built Italy's first airplane in 1909. This helicopter will be given test flights very soon, will be in the "your pocketbook" class. The bottom photo is of the C-46 Commando, an all-metal cargo plane that will be built in Higgens' new plant at Michaud, near New Orleans. The State of Louisiana will soon be producing all new means of transportation, with an added angle of breaking up the pre-war Cal.-Fla. friendly-enemy combine.

Aussie Engine

IT TOOK only four months to build this new Garrett narrow gauge engine (left), a record for locomotive construction. The engine has completed its trial runs and is the first of 24 to be built at the Victorian Railway workshops for the Commonwealth Land Transport Board for the Queensland railways in Australia. There are no wheels under the center.

Cyclone Dehydrater

IN THIS giant dehydrator (right) a cyclone of wind inside of large pipes attains a wind velocity of sixty miles per hour. William B. Winter of Newton, Mass., invented and put into practical operation this device for drying food. Here it is mounted on the side of the building of the Atlantic Research Associates for whom the process was devised. In the large funnel-shaped tank (left) the food first enters and strikes the air cyclone. It is whirled around in the vortex and dropped down the pipe to the joint of the V pipe, where it meets warm air from the gas furnace (on ground). It is then drawn up the next pipe into the other two funnel-shaped tanks (right), where it is again whirled in a cyclone —this time coming down to conveyor.



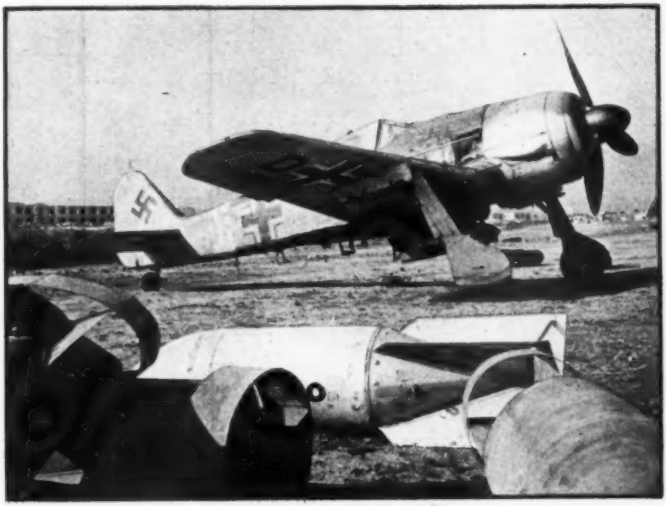
Terrible "Typewriter"

A GERMAN 20mm. four-barrelled anti-aircraft gun (left), one of four captured outside the Salerno Aerodrome, does no more "sky typing" against the allies. After a terrific baptism of fire, U. S. troops of Fifth Army pushed inland and captured much German materiel.

Mechanix Illustrated

Deadly Double Chin

THE B-17G Flying Fortress, Eighth member of the great clan of Flying Forts, has a double chin. This new turret is power operated and remote controlled, mounts two .50 cal. machine guns with an approximate range of 1,000 yards. The main objective of the guns is protection of the vulnerable bombardier's "glass jaw." By parrying frontal attacks by enemy fighter planes, the Fort's important nose is no longer a danger spot because of the Nazis' favorite tactic—head-on assault. Former nose guns were hand operated. Here, a worker is in "green house" from which guns are fired.

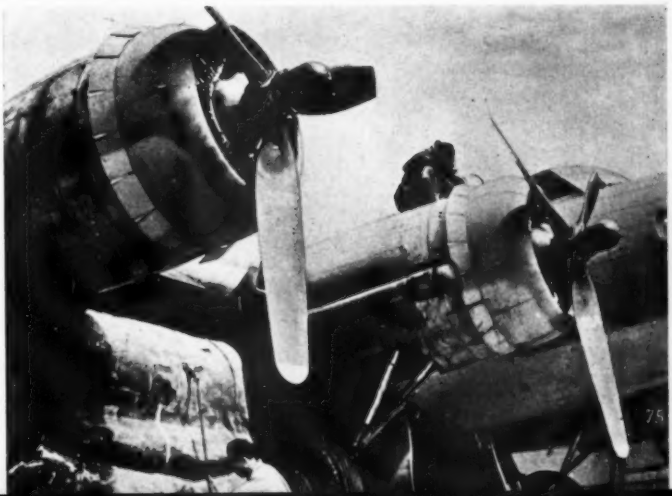


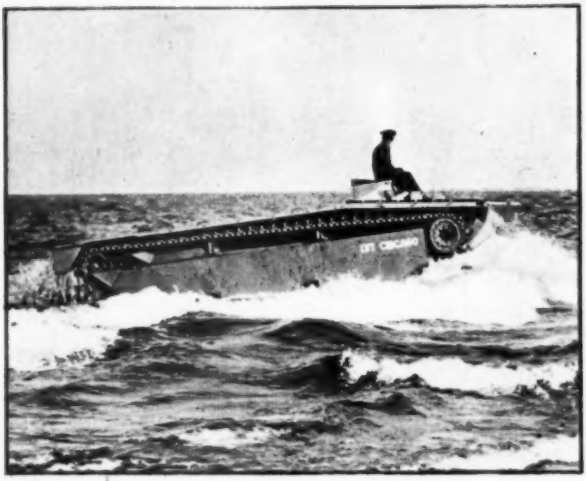
Lone Wolf Caught Napping

AND here (left) is one of the toughest Goering Guerrillas on which the new fortress guns will be trained. It's the Focke-Wulf 190, no Nazi sissy according to most reports. When the R.A.F. took over the enemy aerodrome at Monte-Corvino in the Naples area, they found this Wulf with a full bomb load. It was left intact by the fleeing Germans, bomb ready but pants down.

Lend-Lease In Reverse

MEMBERS of the U. S. Army Air Force stationed in Great Britain frequently are in a position to appreciate the British end of Lend-Lease arrangements. To the right is a British lifting bag pushing up the wing of one of our Flying Forts. Lifting bags are powerful and gentle jacks.





Do You Believe It Floats?

THE Water Buffalo, left, is the Marine Corps' successor to the Alligator as an amphibian landing tank. It is larger and more maneuverable than the old model. It was used in landing operations in Sicily, Attu and the Solomons. Seen here, as it rides the waves on Lake Michigan, it seems to be floating directly on the surface of the water. These comparatively small amphibians can withstand a remarkable amount of rough water, are the very devil to put out of action on water or land.

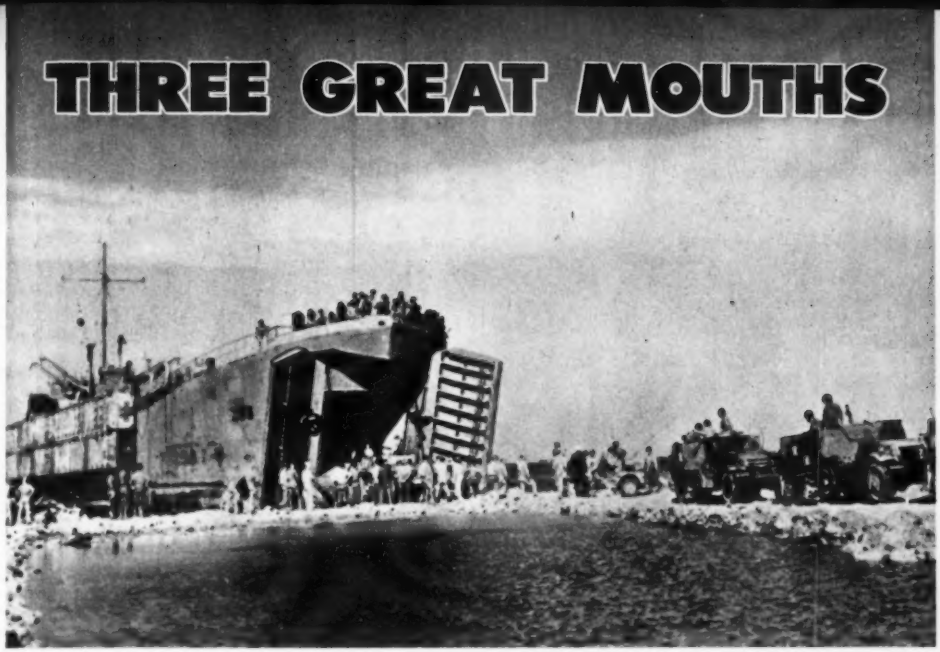
It's Getting So Even The Mail Boxes Talk Back To You!

TO ALL the various gags about talking dogs, add the newest contraption—a talking mail box! Under new postal regulations, you must include the number of your friend's postal zone in the address on the letter you are sending him. The post-office found citizens were slow in learning their postal zone numbers; so they rigged up the talking mail box as propaganda. You tell the mail box your address, and a voice from it tells you your correct zone number.

Stenos Will Hate It

A TYPIST has set a new world's speed record of 180 words a minute, compared with the previous record of 149 words a minute, using a typewriter with the keyboard rearranged as shown in the photo at left. The letters are arranged so the left hand will not have so much work to do. Future typists will benefit from the start, but the present army of stenos must practice anew.

THREE GREAT MOUTHS



THE soldier-disgorging jaws (above top) of the Landing Ship-Tank swing wide open to allow an invasion force of men and materials to pour forth onto Attu, the Solomons, Sicily, etc. This is the iron whale of Axis nightmares. Immediately above, huge lips that were sealed about 1,300 years ago, have been unearthed by the National Geographic Society-Smithsonian Institution Archeological Expedition. This is the colossal "La Venta Head" dug up near La Venta, Tabasco State, Mexico. It's a cast of the original sculpture which weighed 20 tons, was used in religious rites. To the right, a Naval bird of prey, the PBM-3 Mariner Patrol Bomber, shows its aluminum beak as it rests on assembly line of the Martin plant.

"As Tired As A Crutch?"—Not With This Invented Gadget

CRUTCH-USERS know what it is to be worn out and to search vainly for some place to sit down and rest. The photograph at the left shows the answer to crutch-user's prayer, an attachment which converts a standard crutch into a comfortable seat at a moment's notice. The device is light, simple and inexpensive. It may be installed on any standard crutch in a short time. It was developed at the Crosby Research Bureau, Pasadena.

Rubber Gloves, Ladies!

CLAIMED to be the greatest advance to date in synthetic rubber, a product of the Martin Plastics Research Laboratory known as "Marvinol" is soon to go on the market. Because it is impermeable, Marvinol used in inner tubes (right) makes the tubes "seep proof." Tubes of this type have traveled more than 8,000 miles without having air added. Gloves made of the material (below) are said to be better than those of real rubber.

The new lightweight television camera recently perfected by RCA, above. Taken aloft in a plane it gave New Yorkers their first aerial television show.

EYE OF THE FUTURE

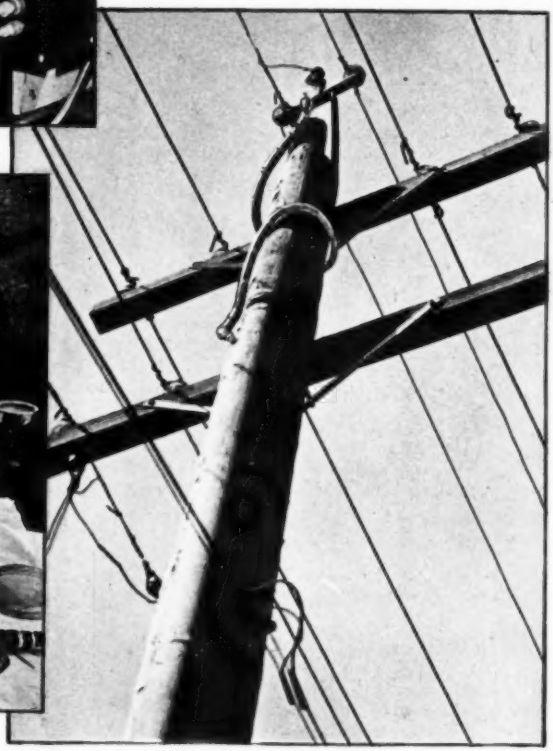
AN AIRPLANE flew over New York recently and a new television camera in it took aerial pictures of the city and broadcast them to thousands of New Yorkers' television receivers. At the same time, RCA released details of the progress its laboratories have made during the war in this science and forecast that when the war is over television will at last blossom into maturity. New televisors can pick up a football game on a rainy November afternoon so that the television screen sees the play better than spectators.

The orthicon, new scanning eye of television, shown in the hands of its inventor, RCA's Dr. K. Zworykin.

And this Dumont vacuum tube receives the television pictures, makes them appear on a fluorescent screen.

First Automatic Pilot Photo

ONE of the most closely guarded secret weapons of the U. S. Army Air Forces has been the newly developed automatic pilot, called by bomber pilots "Silent Joe." The photograph at left is the first picture of the control device to be released by the Army. Returning from a bombing raid, after the plane has outranged flak and fighters, the pilot merely sets his course, according to the navigator's determinations, and "Silent Joe" automatically brings the plane home. Most large bombers and many of the smaller attack bombers are equipped with the automatic pilot. Your peacetime commuter may sport one in time.



Here's St. Patrick In Reverse

ST. PATRICK was commissioned to clear the Emerald Isle of snakes. Ed. Gabrielson was commissioned by the Palo Alto, Calif., Power Company to produce snakes. It seems the power company was having trouble with a scourge of woodpeckers which played havoc with its power poles. Mr. Gabrielson volunteered to make realistic king snakes from painted wood. Placed on a pole (above) "scarecrows" keep the woodpeckers away.

It's Not Like The One On Your Washing Machine

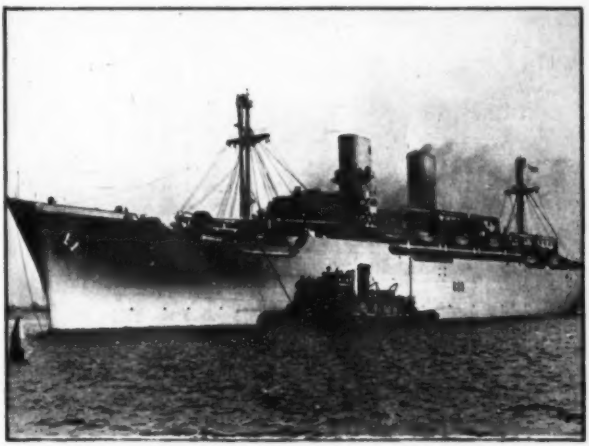
THIS 100-ton giant is an electric motor being built by Westinghouse for use in rolling steel plate in one of America's new steel mills. It will develop 7,000 horsepower, according to company officials. The giant rotor, containing more than 50,000 feet of copper wire, will roll over at 80 revolutions per minute and power equipment which will squeeze out two-inch steel plate 120 inches in width. The completed motor, of which this rotor is but a part, will weigh 264 tons. The workman here is adjusting a commutator neck which feeds electricity into the rotor. It makes veritable pigmies out of the power plants that heretofore drove plate-rolling machinery in our steel mills.

Bazooka's Baby Brother

THE new-type rifle grenade shown at left fills in the armament gap between the hand grenade and the Bazooka rocket gun. Fitted onto the muzzle of an old .30 caliber 1903 Springfield rifle, the grenade carries several times as far as a hand grenade can be thrown and is used for smashing tanks or pillboxes. A neat use for the rifle that the Garand outmoded.

"Invasion Specialist"

AT RIGHT is the first privileged photograph of the "Invasion Specialist," a huge troop transport of tremendous speed now being turned out on a production line at Kearny, N. J. It is "sewed and nailed together" with 150 miles of welding seam and one-third of a million rivets. The ship is said to have sufficient speed to outrun any submarine. The success of troop transport liners such as the Queen Mary, safer because of great speed, has proved the point.



Your Post-War Steel Highway

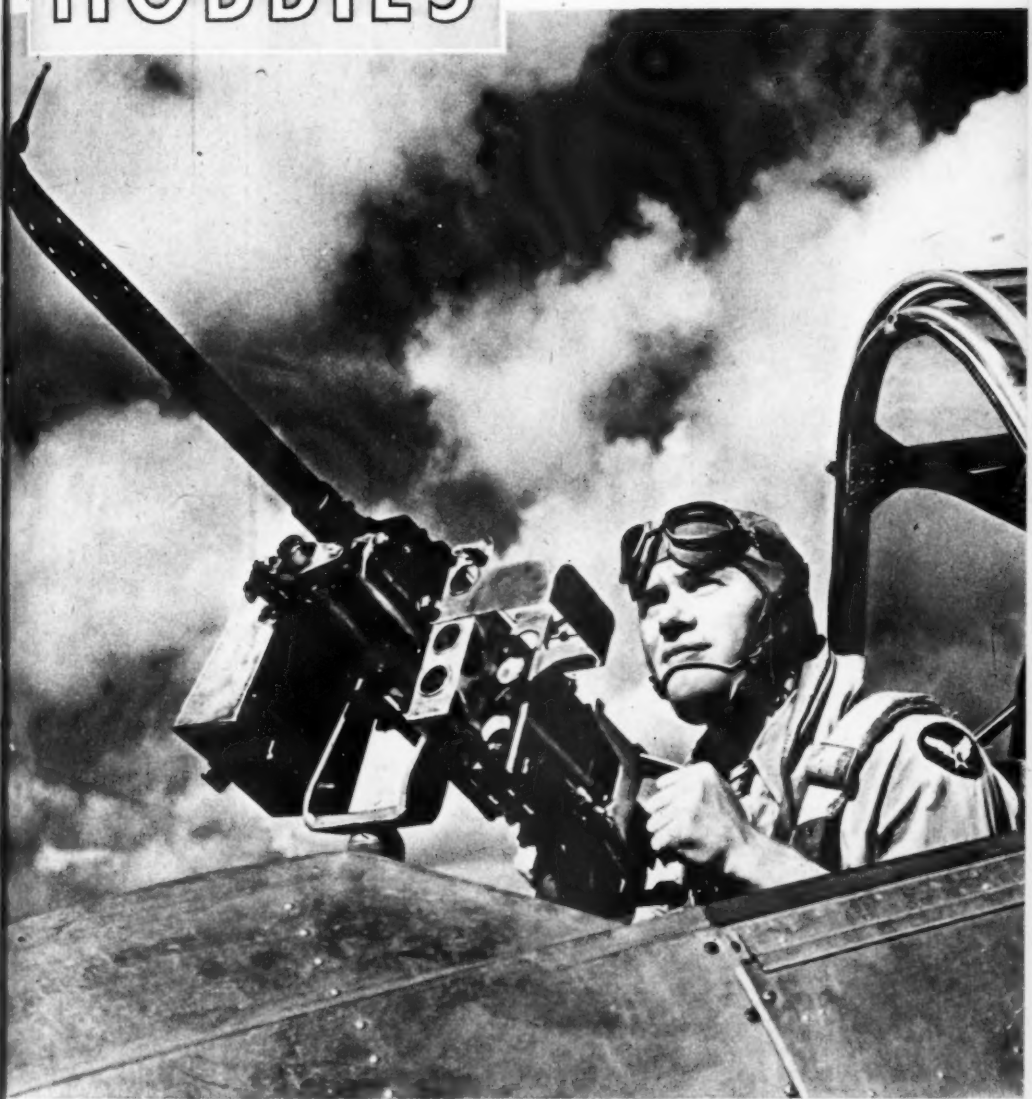
HIGHWAYS of the future will have lifted a chapter from the book of aircraft landing fields. Above, the first installation of a steel roadway strip to test practicability for post-war construction is made in the township of Darien, Conn. Project is joint venture of Darien and Irving Subway Grating Co., originators of the grating mat panel technique for road building. Left, first passenger going over the steel road is Mrs. Walter Barret of Darien. Yes, she likes it.

Allied Eye Of The Pacific Night

NEAR a New Guinea beach (at the right) this giant searchlight was set high in a big tree. Then it was effectively camouflaged to cheat Jap fliers. Its stabbing beam, backed by accurate anti-aircraft fire, kept the yellow raiders high in the night sky. Two Robinson Crusoe soldiers seem mighty pleased with the handiwork that built such an effective platform out of odds and ends and stout jungle growth. Still—that metal roof must be hot!

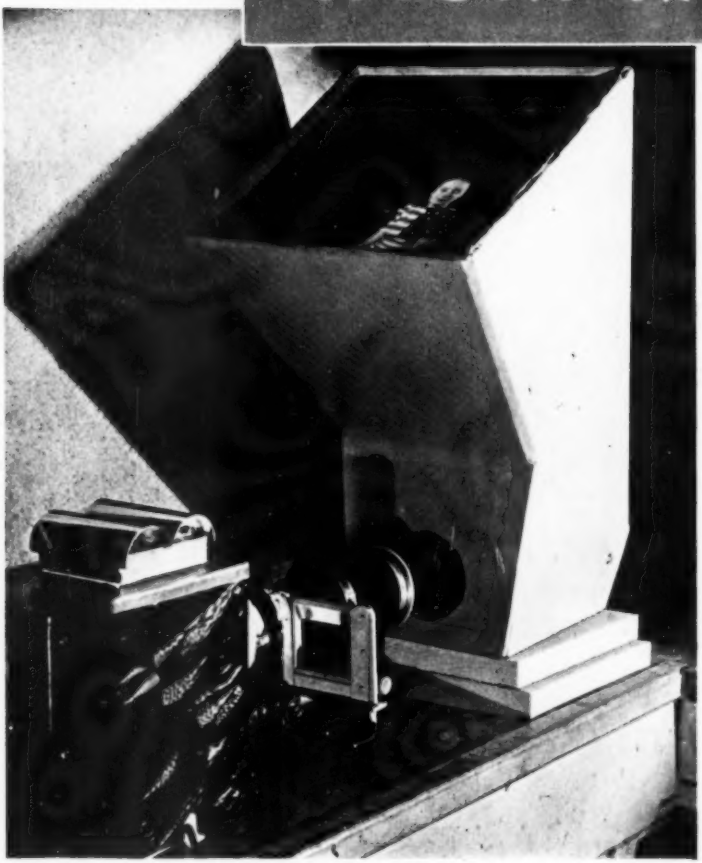
CRAFTS AND HOBBIES

How you can become a fighting flyer with the U.S. Army Air Corps. See page 102.



PHOTOGRAPHY • THE WORKSHOP • MODELS • HOME AIDS
NOVELTIES • WOODWORKING • IDEAS FOR SERVICE MEN

SHORT-RANGE P



This shows the completed viewer in operation—upright position. The projector is easily operated from low table or stand.

by WALTER E. BURTON

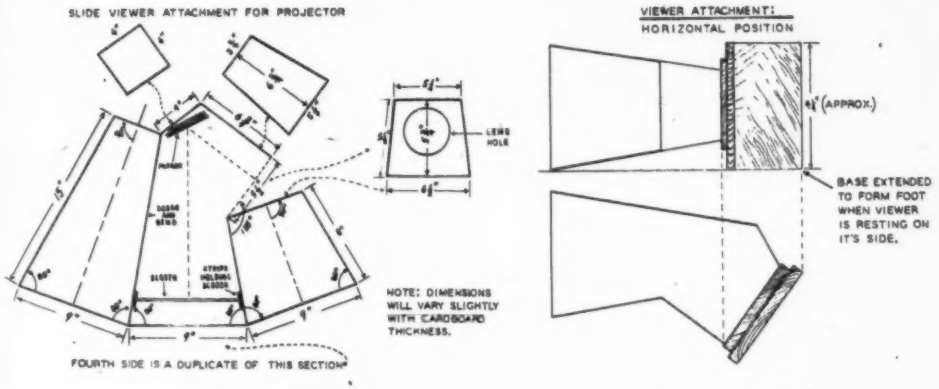
EVER want to project color slides when you didn't have a darkened room handy? The short-range viewer shown in the photographs is intended for use in such cases. When it is placed in front of a standard slide projector, a brilliant image of the slide is formed on its 6½" square screen.

The viewer is made largely of scrap cardboard, either corrugated, as used in the model shown, or a fairly stiff chip board such as that employed in non-corrugated packing boxes. In addition, you will need some gummed paper or paper strips and a suitable brush-on adhesive; a piece of ground glass or translucent paper measuring about 7¾" square, a small mirror about 3½" square, small wood screw and washer, block of wood ¾" in thickness and 3½" square, some ¾" boards for base, some black drawing ink or dull-finish black lacquer, and lacquer or other material for finishing the outside.

Rays of light from the projector lens strike the mirror and are reflected in the direction of the viewing screen. First, lay out the cardboard parts according to the patterns in the drawing. Make all cuts straight, using a sharp knife if the material is corrugated cardboard; shears will crush it too much. Each of the sides may be cut as a separate piece, or two or three of them can be combined as indicated, the lines of fold being scored with a knife.

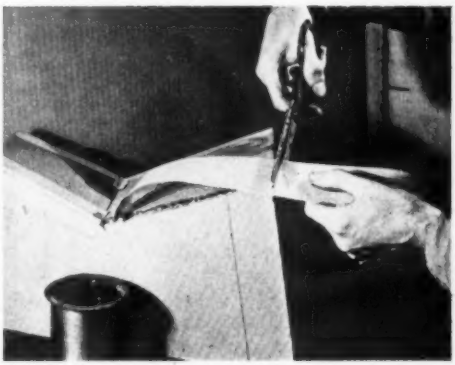
Use strips of gummed paper or of any strong paper or cloth to which a glue or paste has been applied, to bind all edges. This results in a housing of considerable stiffness. If you wish, you may leave one of the small panels at the rear so it can be opened like a

PROJECTION BOX


SLIDE VIEWER ATTACHMENT FOR PROJECTOR
LENS HOLE
NOTE: DIMENSIONS WILL VARY SLIGHTLY WITH CARDBOARD THICKNESS.
FOURTH SIDE IS A DUPLICATE OF THIS SECTION
VIEWER ATTACHMENT: HORIZONTAL POSITION
(APPROX.)
BASE EXTENDED TO FORM FOOT WHEN VIEWER IS RESTING ON IT'S SIDE.

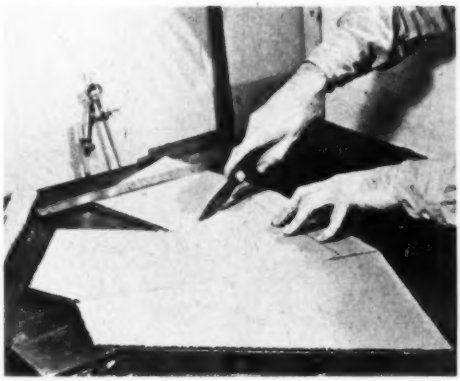
door to give access to the mirror. If you use corrugated cardboard, bind the front edge of the housing around the viewing screen with gummed paper, to provide a smooth finish.

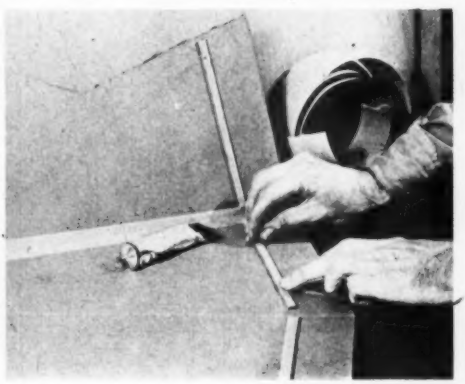
The viewing screen rests against ¼"x½" wood or cardboard strips glued inside the housing about 2" from the four front edges. These strips may be applied either before or after the cardboard is taped together. The opening through which light from the lens enters the viewer should have a diameter equal to or slightly larger than that of the lens barrel. In use, the lens may be positioned either in the opening or a few inches from it.



Below: Gluing wooden strips for holding the viewing screen. Bind with strips of gummed paper (above).

Lines are drawn on the heavy corrugated cardboard structure material to indicate folds to be made. The pattern lines must be scored with knife, as shown.





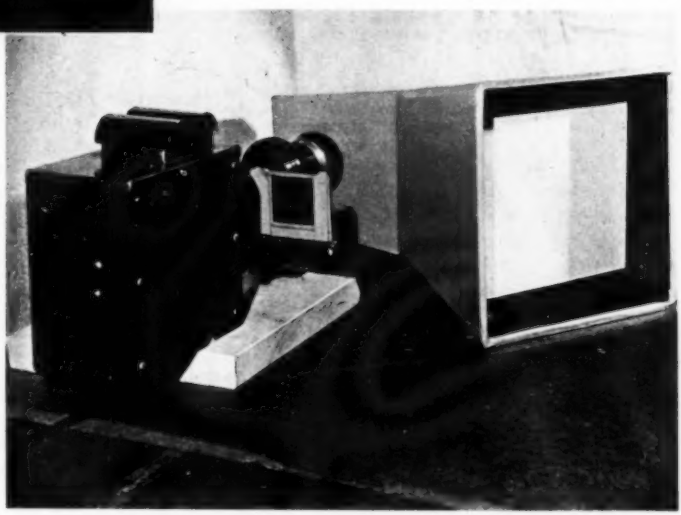
The mirror is mounted on a wooden block which is held inside housing with small wooden screws.

Above: Viewing screen being placed in position; screen is made from translucent paper glued to a frame or of ground glass.

The wooden block is the mirror support, and one of its edges must be beveled with a plane or knife so the block surface will be parallel with the viewing screen, when that edge is against one of the box sides. The small wood screw passes through the cardboard into the edge of the block, the washer keeping the head from embedding itself too deeply. Usually one screw will hold the mirror block adequately, but another may be added after adjustment has been made, if necessary. The mirror may be fastened to the surface of the block with glue, or held with adhesive tape overlapping the corners.

For the mirror, any piece of silvered glass, preferably not too thick, may be used. A handbag mirror, if of the right size, will do, and may be easier to mount than a "bare" piece of glass. The best possible mirror is one silvered on the front surface, so that there is no chance for a double image to be formed. Mirrors used in reflex cameras are of this type; and special first-surface mirrors usually may be obtained from optical supply companies. Of course, the mirror should be reasonably perfect: if it is wavy or otherwise irregular, the image will be poor.

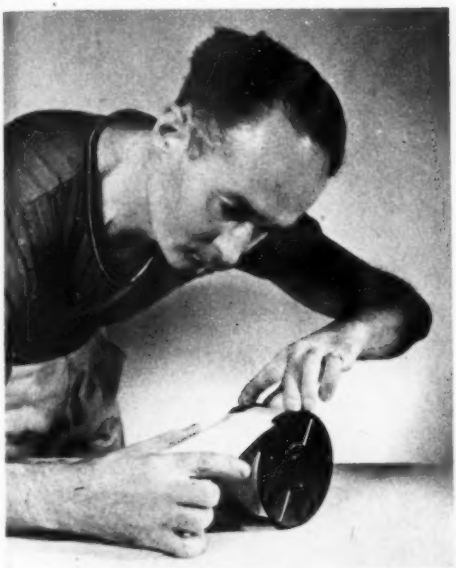
The viewing screen may be made from various materials. A sheet of ground glass mounted with the rough surface outward, is perhaps the best. If no such glass is available, a sheet of translucent paper, such as thin typewriter paper or onion-skin second sheet, can be glued to a cardboard frame measuring 6½"x6½" inside and 7¾"x7¾" on the outside. Be careful to avoid wrinkling the paper. The screen rests against the strips inside the housing, and is held in place by pieces of adhesive tape or by other [*Continued on page* 132]



Right: Completed apparatus in a horizontal position, ready for use. This arrangement is most suitable for operation on a high or medium table.

PHOTO KINKS

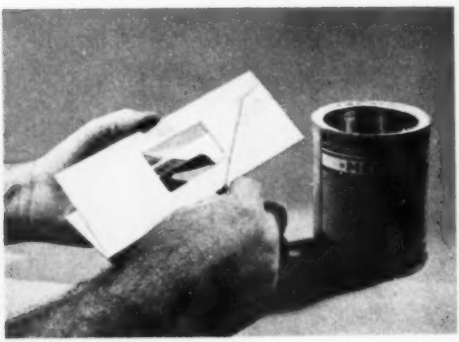
by Kenneth Murray



LOADING DEVELOPING REEL: Sticking of film when loading a tank reel can be overcome by twisting the ends of the reel. Hold the ends with two fingers as shown and twist them back and forth slightly at the same time "inching" film forward into the grooves.

TO REINFORCE PHOTO PRINTS: Stiffen prints made on single-weight paper by painting the backs with a coat of white rubber tire coating, still obtainable at auto supply stores. Upon drying this will reinforce them by forming a tough, flexible, rubber coating.

REFLECTOR CONVERTS SPOTLIGHT: Your photo spotlight will serve as an efficient floodlight if you remove the condensing lens and substitute a reflector of white cardboard. Coat it with waterglass (sodium silicate) so that it will resist heat and retain its shape.



CARDBOARD NEGATIVE HOLDERS: Satisfactory negative holders can be made from stiff cardboard. Fold a piece of cardboard in half and cut openings with a razor blade. Coat with waterglass to harden and to protect from heat. Finish with black paint.

MECHANIX ILLUSTRATED is once more in the market for short photography items for this page, and will pay up to $5.00 for each one used. Look around your darkroom for some of those original ideas you've been using, take some nice clear pics of them, write a few words of explanation and send to: Photo Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, N. Y.

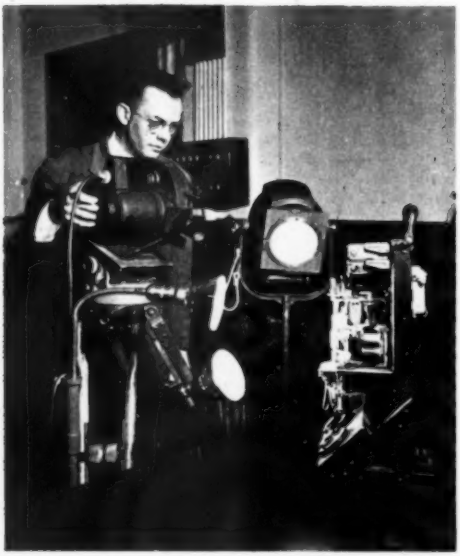
8,000 PICTURES PER SECOND!

Here's a gadget which will make you shutter-bugs, who go in for high-speed stuff, sit up and take notice. It's the new Fastax camera.

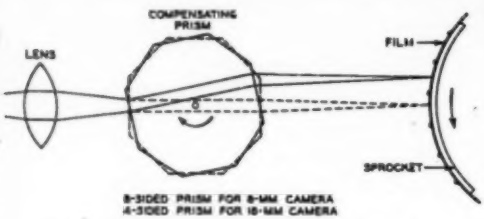
FROM the laboratories of the Bell Telephone Company has come the "last word" in high-speed photography. It's the Western Electric *Fastax* High-Speed Motion-Picture Camera. Although essentially a laboratory instrument used in research and design analysis of equipment such as fuses, relays, arcing contacts, etc., it also has been used with success in studying the action of lathes, shapers, punch presses and milling machines, and it certainly does give us an idea of what we photographers can expect from the post-war world.

The *Fastax* is made in 8-mm. and 16-mm. models; the 8 will take from 300 to 8,000 pictures per second, and the 16 from 150 to 4,000 per second. The camera is electrically operated and employs between the lens and film [*Continued on page* 138]

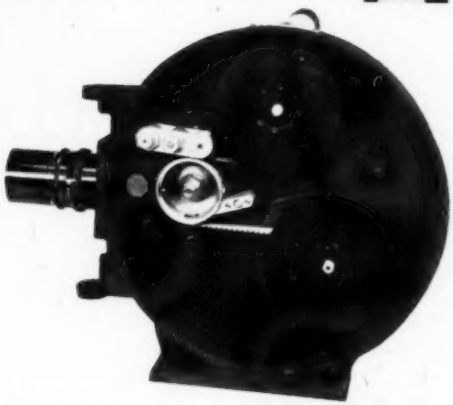
Fastax took these shots of a clapper in the act of striking a telephone bell.



The Fastax has many uses in the laboratory.



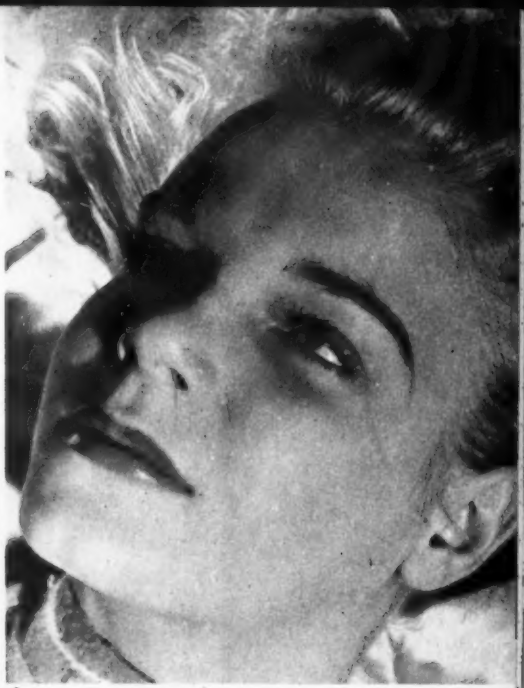
Rotating prism synchronizes images to film.



Notice prism, sprocket wheel and film (above).

PHOTO CONTEST

FIRST PRIZE ($10.00): Golden Girl, by P. J. Samerjan, Staff Photographer, Army and Navy General Hospital, Hot Springs, Arkansas. SECOND PRIZE ($5.00): Uninvited Guest, by Lou Gardner, Detroit, Michigan. Camera: Speed Graphic. THIRD PRIZE ($4.00): Beach Scene, by Frank Meitz, St. Louis, Missouri. Camera: Speed Graphic. FOURTH PRIZE ($3.00): Cloistered, by Stanley Kant, Grand Rapids, Michigan. Camera: Argus C-2.



1st PRIZE

2nd PRIZE

3rd PRIZE

4th PRIZE

Submit prints for this month's contest unmounted—no larger than 8x10 inches. With each print list your camera, film, lens opening and shutter speed, illumination, and developer. Write your full NAME and ADDRESS on the back of each print, and wrap securely with cardboard or corrugated stiffeners. If you want unused prints returned, YOU MUST ENCLOSE RETURN POSTAGE. (Published prints cannot be returned.) Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, N. Y.

BEATING OLD MAN WINTER

Good attic or loft insulation is one way to save your heating money. Rock wool or other insulating material sprayed on the floor through a hose (left) will help prevent air leaks and keep the upper floors warm.

Above: Prefabricated felt pad insulation is excellent wall protection against cold and drafts, and is very easily installed. Left, above: Never leave radiators turned on in a room with the windows open. One such radiator can cool off the whole heating system.

Left: To prevent loss of heat into the cellar, all hot water or steam piping should be covered with either asbestos cement or air-cell jacketing, made for the purpose and obtainable from mail order firms.

WOULD you like to save real dollars each winter on your home heating bill, and at the same time enjoy greater comfort? Then check carefully on a score or more simple factors that make heating easier and less costly.

Let's start with a factor common to all steam and hot-water systems—the paint on your radiator. If it is aluminum or gold bronze paint, the radiator is losing upwards of five percent of its radiated heat by reflection back into the metal. Several coats of good linseed oil paint, applied thin to a warm radiator, will straightway knock a bit out of your fuel costs.

Then look to your [*Continued on page* 138]

Above: Insulation that has broken away from the boiler is a serious cause of fuel waste as it permits dissipation of heat into the cellar. All such holes or cracks should be patched with asbestos cement.

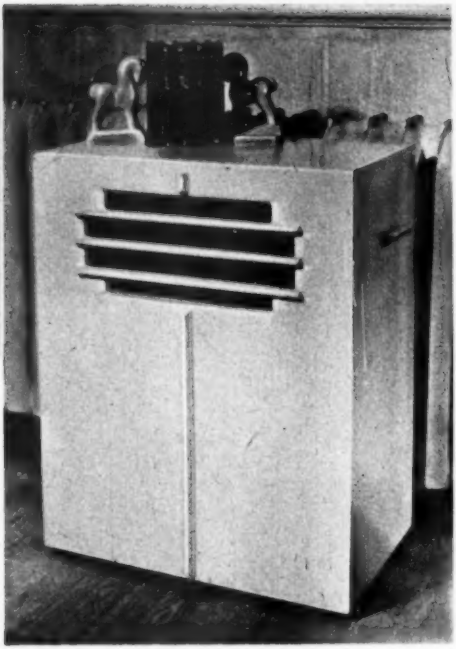
For efficient radiation, all air valves on radiators must function properly. If the small hole in the cap is clogged up a pin will open it. If valve doesn't work even when clean, and steam pressure is good, try turning valve to 45° angle or even upside down.

Right: By cleaning the surfaces of flues and upper part of the fire box regularly with a wire brush or scraper you save fuel money. One-eighth inch of soot on flue surfaces reduces boiler efficiency 25 per cent.
Three Lions Photos

HOME HUMIDIFIER

Steam and hot water heating plants dry out your house uncomfortably during the cold months, unless the air is properly humidified. This homemade unit will do the trick nicely.

by Clement W. Cook

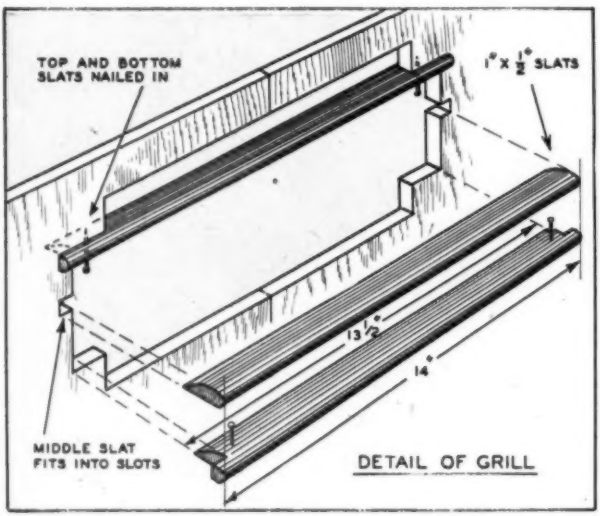


The finished humidifier—a useful, smart piece of furniture for living room or bedroom. Grill bars and chrome-trimmed plastic handles lend modern touch.

HERE'S one way in which the amateur putterer can make home a more pleasant place in which to live. The humidifier shown here is inexpensive to build, and evaporates a gallon of water a day into the atmosphere of your partment, house or flat, where artificial heating or arid weather conditions dry out the air.

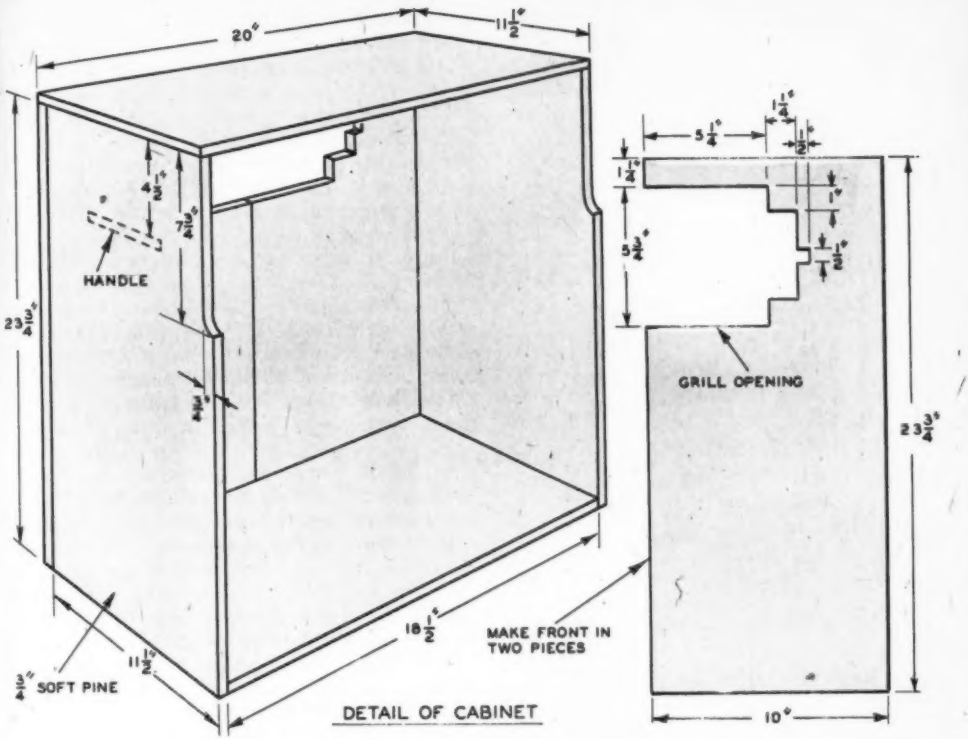
Operating on a forced water-feed system for better efficiency, rather than on the usual method of blanket absorption and air current only, the humidifier consists of a cabinet with built-in metal water compartment, a small electric fan carrying a loose belt on a pulley, and a mesh blanket upon which the water is thrown by the belt to be evaporated by the air stream from the fan.

Building the cabinet is not difficult. Made of ¾" pine, it is fastened together with countersunk screws, 1½" in length. Wood filler is used to cover the screw holes, and is sanded down before painting. The only tricky job in making the cabinet is constructing the grill. Two ¾" thick pine boards, 10" wide are set side by side for the front of the cabinet, half of the grill outline being cut in each. The grill slats are simply 13½" slats of wood about ½" thick and 1" wide, finished with an airfoil curve and fitted against the top and bottom steps of the grill outline, the middle slat being sunk in a ½" groove.



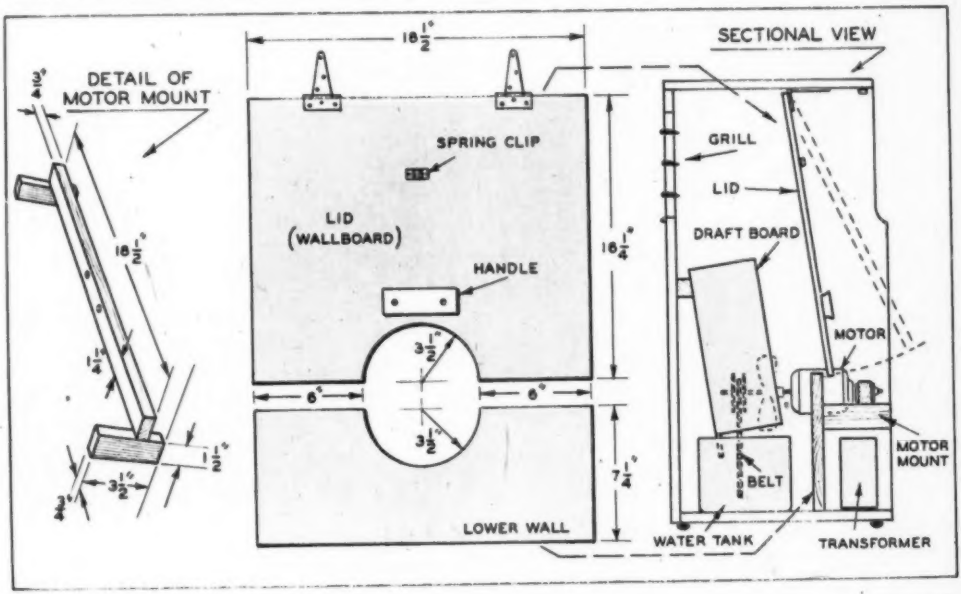
Small rubber tip feet are added to the cabinet at each corner to avoid scratching floors when moving the humidifier. The crack between the two pine boards used for making the front of the cabinet can easily be covered with a strip of molding, as seen in the photograph. Top edge of cabinet is rounded at front and sides.

After assembling the cabinet.



DETAIL OF CABINET

putty up or fill all cracks and crevices before painting the inside, as water entering the wood will cause warping. The inside of the cabinet is then finished with two heavy coats of black enamel as protection against the dampness. The outside of the cabinet, after



sanding, is given three thin coats of cream enamel. The addition of a plastic handle of the drawer type on each side of the cabinet makes the humidifier easy to move and adds considerably to the appearance.

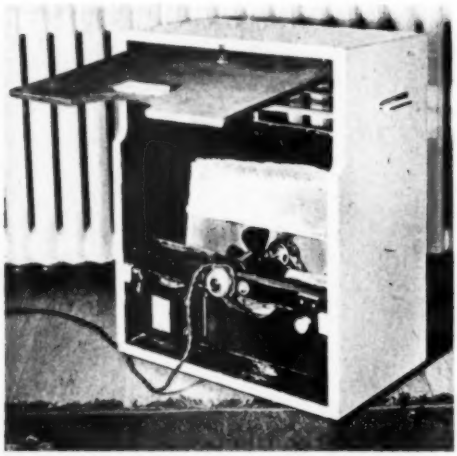
The back lid of the humidifier is incorporated into the cabinet to prevent back draft from the fan and corresponding loss of efficiency. Using this construction, all the air gathered by the fan is forced through the wet blanket and through the grill at the front.

The back lid is made from a piece of ½" wallboard and is hinged to the top of the cabinet, the lower part resting against the lower wall. One half of the circle in which the fan operates is in the lid, the other half of the circle being cut in the lower wall. The inclined angle of the lid acts as a deflector for stray air currents in the humidifier, forcing these up and out through the grill. A small snap catch is screwed to this lid and locks into its counterpart fastened to the top of the cabinet, so the lid will stay open when water is being added to the humidifier tank. A small wood-block handle is screwed to the lid for ease of opening. Should there be any difficulty in keeping the lid firmly closed when the humidifier is in operation, add a small turn-catch at the bottom of the lid, to lock it closed against the lower wall.

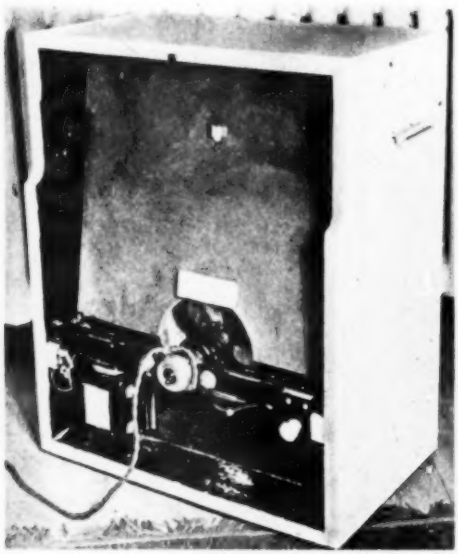
The motor mount is simply a piece of wood 18½"x¾"x1¼", at the back of the cabinet, supported on two blocks screwed to the side walls. This arrangement holds the motor centrally, with the circular air channel in the back lid and lower wall.

For quietness of operation small rubber grommets support the bolts holding the motor.

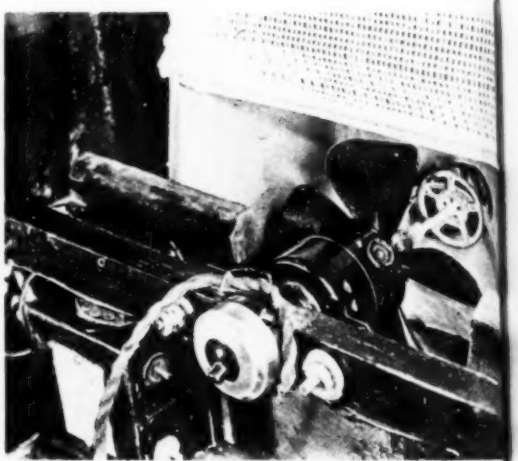
The electric motor used in this humidifier is taken from a standard hot-water car heater of the fan type and was removed from the heater together with the speed control,



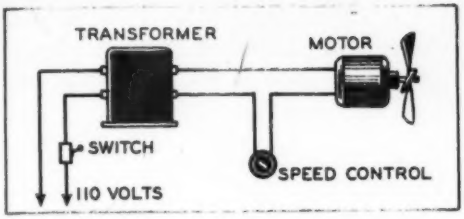
Back lid of humidifier is held open by a snap-catch. Note blanket on draft board, motor and transformer.



Lid closed. Humidifier is filled by opening lid and pouring water from bottle against inclined draft board which also serves as drip guide to the water tank.



Closeup of operating mechanism. Typewriter ribbon spool carries loose belt for water spray on blanket. Any 110-volt A.C. or 6-volt D.C. motor may be used.

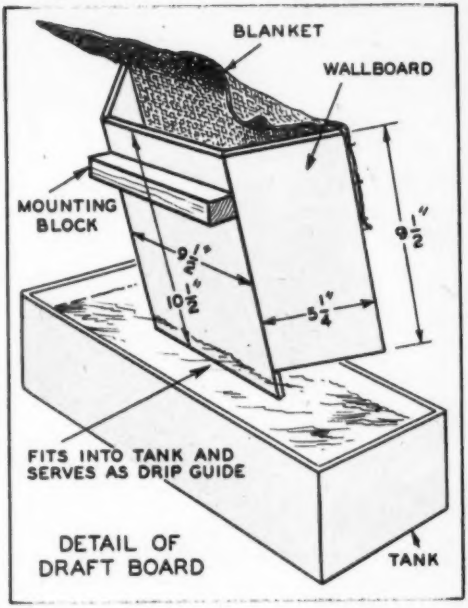


Parts ready for assembly. Tank is placed in position before draft board is installed. Dishrag is strung on some brads across the latter. Lid is mounted last.

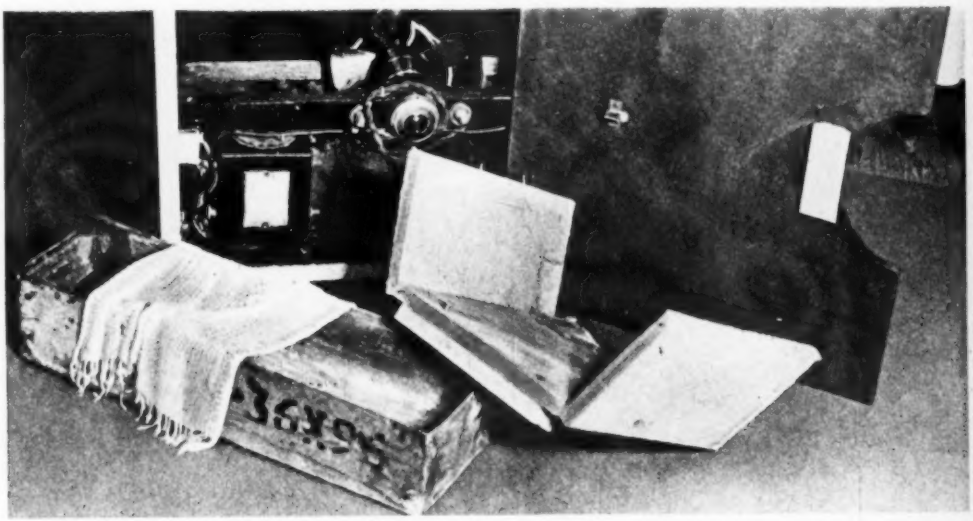
usually operated from the dash. It runs from a small 60-watt electric train transformer which supplies the six or seven volts required for such a low-voltage motor. With slight adaptation of the motor mount, any small electric fan of the 110-volt type can be used.

Before mounting the motor, extend the shaft by soldering a 3-inch length of copper or brass tubing to the shaft ahead of the fan. On the end of this shaft, solder a standard 2" diameter typewriter ribbon spool. On this spool a loose belt runs, dangling into the water tank. Spinning loosely on this spool, the belt throws up a spray onto the mesh blanket. The fan behind this spool forces air through the wet blanket for evaporating.

Standard humidifier belts are available, but the one used here is fashioned from two pieces of tire blow-out patch, cemented together, the whole length of the belt being notched with a hacksaw to provide slots and dangling threads which pick up the water and create a spray. It hangs almost to the bottom of the tank.



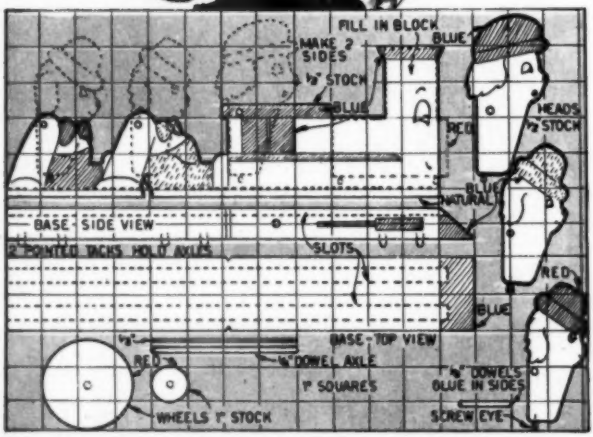
The draft wall, or draft board, fastened to the front of cabinet, inside, below the grill, acts both as a deflector for air currents, directing the fan slip-stream upward, and as a support for the evaporating blanket. The blanket is simply a soft cotton mesh dishrag, obtainable in any hardware or dime store. Small brads are fastened in the sides of the draft board so the blanket can be removed for washing. The [*Continued on page* 134]



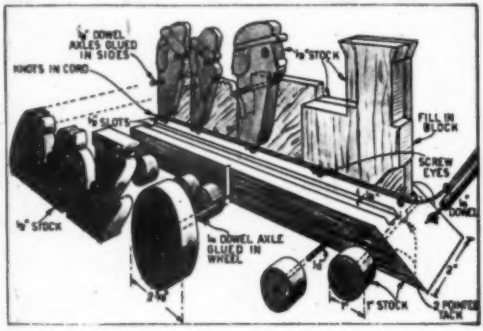
TOYLAND TRAIN

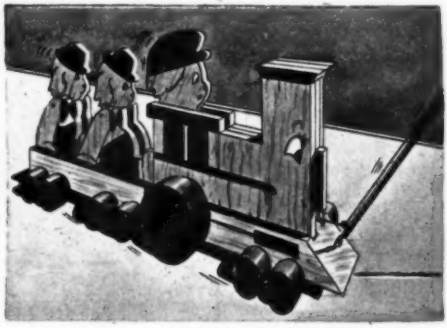
YOU can easily make this little toy train, its engineer and two passengers with hand tools and scrap lumber. The heads are moved by a cord which threads through the train and up the handle.

First cut the base 2"x13" from 1" stock, bevel the front 1" to indicate a cowcatcher; then cut two slots lengthwise each ¼" deep, ½" wide and ¼" in from the edge. Saw a small notch on each side of the base about 7" from the front and drill a ⅜" hole through the side 5½" from the front. Now cut the two side sections, which include the engine and the bodies of the two passengers, from ½" material; glue and tack them into the slots in the base. Jigsaw the heads also from ½" stock, drill $\frac{3}{16}$" holes through as indicated, fasten a screweye to the bottom of each; set them in position, slip a short length of ⅛" dowel through the $\frac{3}{16}$" holes and glue the ends of these axles into the side sections. Cut the fill-in block and fasten two screweyes to the under side as shown; then nail it in place. Run a cord through the screweyes at the bottom of the head sections and the fill-in block, knotting it behind each screweye when the heads are in an upright position. Cut the small wheels, [*Continued on page* 136]



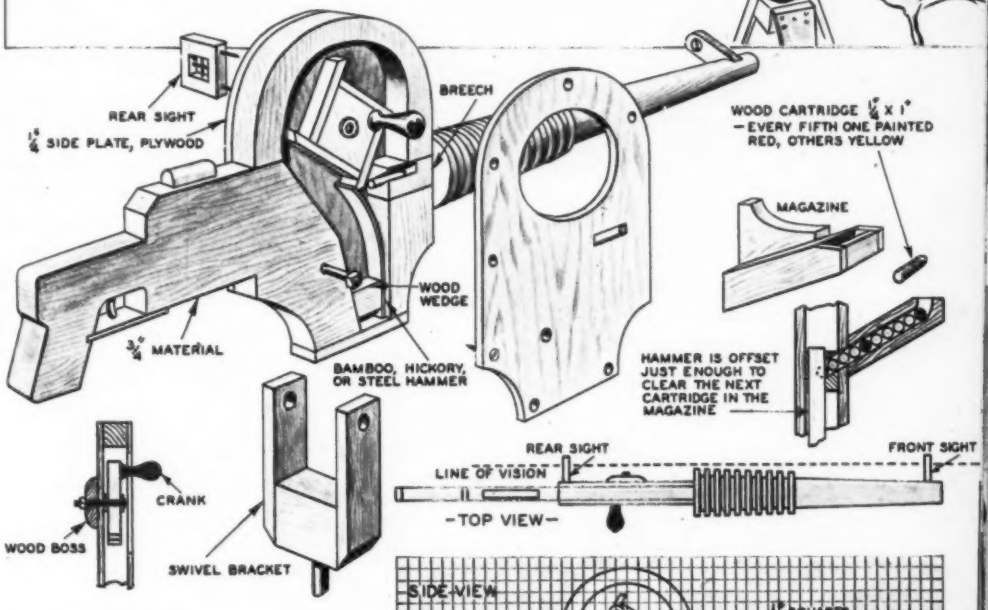
Lay out the above designs for the various parts on wrapping paper or light cardboard, actual size. Cut out the paper patterns thus obtained and paste them on the wood for jigsawing. Follow suggested color scheme or use your own.





JUNIOR MACHINE GUN

You'll get a real "Ack-ack" effect with this all-wood gun, which fires realistic colored tracers.



by Hi Sibley

THIS business-like machine gun not only fires harmless wooden bullets, but having every fifth one painted red, gives the effect of sending tracers. The mechanism is quite simple. A four-spoke ratchet wheel operated by a crank forces back the bamboo spring, which when released, strikes the light wooden cartridge, sending it forth on its lethal (it says here in the script) mission. By practicing, the young gunner will learn just how fast to turn the crank for most rapid action without catching the hammer with the second ratchet before it has had time to strike the first cartridge.

To make the bore in the barrel, select a piece of straight-grained square stock, preferably white pine, rip it lengthwise and make a few circular saw cuts, finishing with a gouge and checking with a semi-circular template. Glue the halves together and turn down on the lathe. The bore, of course, should be carefully smoothed with fine sandpaper but not oiled or waxed. The 5/16" diameter will take care of damp weather expansion making a smooth passage for the ¼" cartridge.

Construction of the frame- [*Continued on page 136*]

DECORATIVE NOVELTIES FOR CHRISTMAS

These gay novelties add color to your home during the holidays, and are all easily made from small ends of lumber.

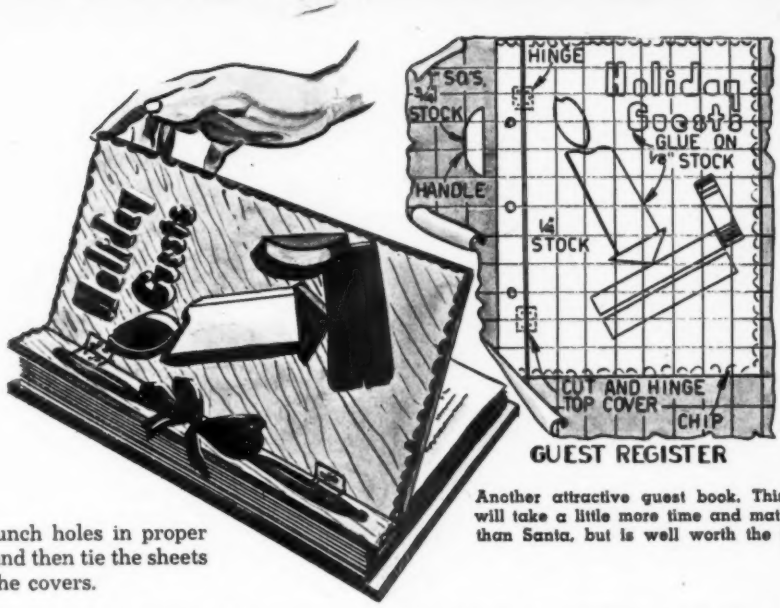
by Roberta Fairall

Your Christmas guests will enjoy signing their names on Santa's register. Make it in just a few minutes.

HOLIDAY GUEST REGISTER—Santa's head is jigsawed from ¼" plywood or presdwood; four holes drilled across the mustache, one in the middle of the cap, one in the tip; and a 1" section of 1" dowel nailed on for the nose. Nose, cap, and cheeks are painted red; the whites of the eyes, eyebrows, hair, and the trimming on the cap white.

Outlines are black and the face and beard are left the natural color of the wood. The leaves of the register are then cut from paper the shape of the beard and the cover cut from white oilcloth with the mouth painted on. Holes are punched to correspond with those in the wood section and the oilcloth and paper beard tied to the wooden head with white ribbon. The word "Guests" is painted on the oilcloth. A string with a pencil on the end is tied in the cap, and your friends register their names on Santa's beard.

For a more formal register, two 9"x12" sections of ¼" stock are cut and three holes drilled as shown in the illustration. The section used for the front cover is then chipped around the edge with a carving tool, sawed in half 1" from the back and hinged. The candle, flame of the candle, holder and letters to spell "Holiday Guests" are jigsawed from ⅛" stock and tacked and glued to the cover of the book. The piece indicating the handle of the candle holder is cut from ¾" stock and nailed on. The book has a natural finish; the candle is painted white, and the holder and letters red. Sheets are made of 8½"x11"

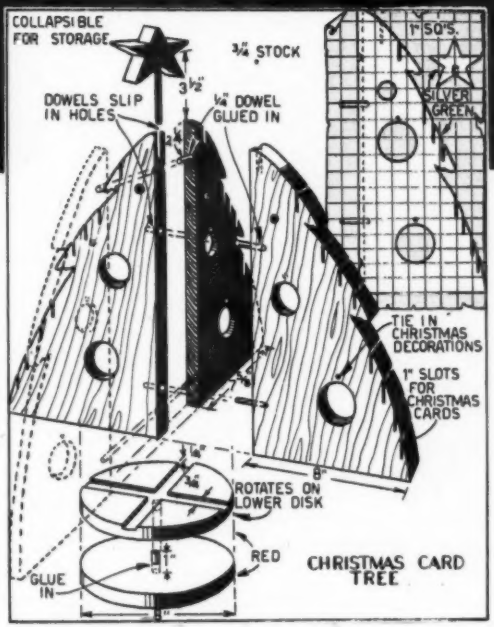


Another attractive guest book. This one will take a little more time and materials than Santa, but is well worth the effort.

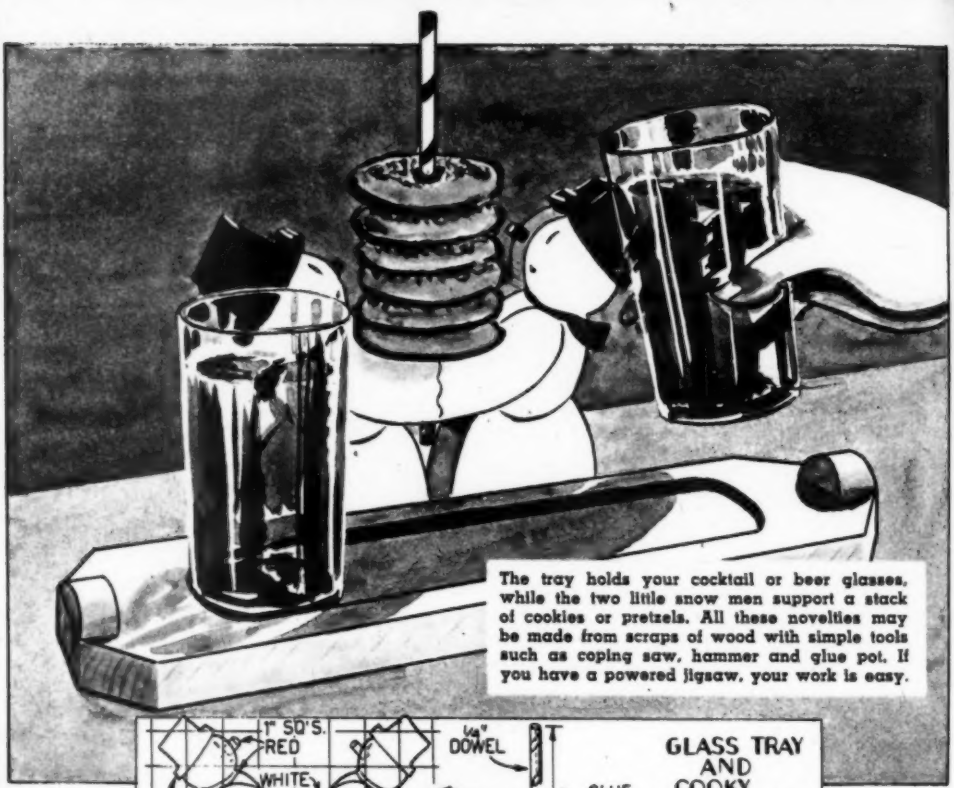
paper. Punch holes in proper positions and then tie the sheets between the covers.

CHRISTMAS CARD TREE—This wooden Christmas tree will turn on its base and is a most efficient display for your Christmas greeting cards. The sections come apart for storage.

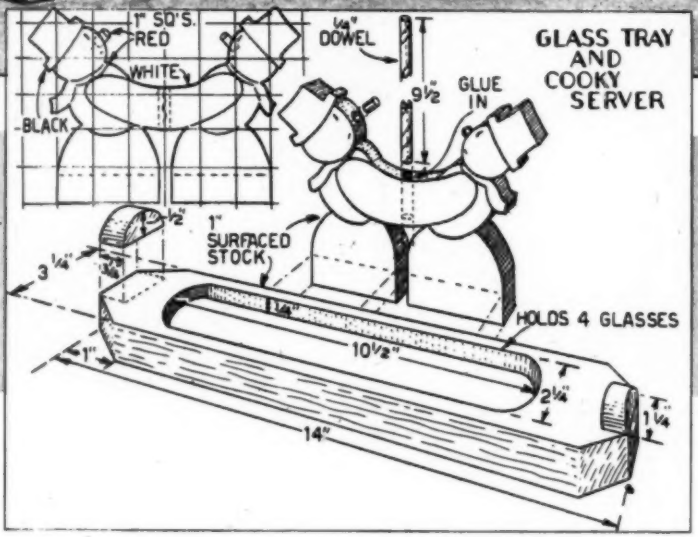
The four sections of the tree are sawed from ¾" stock or 1" surfaced stock, and holes and notches cut as shown in the illustration. Two of the sections are cut 8" at the base. For



Revolving tree will display your Christmas cards.

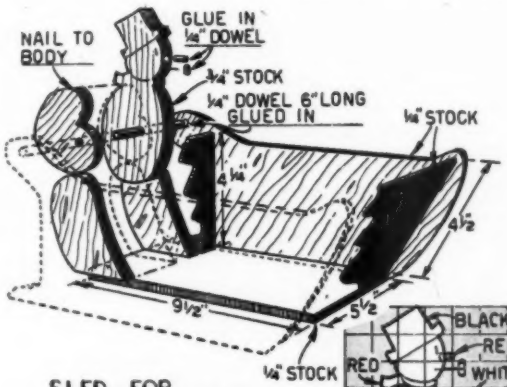


The tray holds your cocktail or beer glasses, while the two little snow men support a stack of cookies or pretzels. All these novelties may be made from scraps of wood with simple tools such as coping saw, hammer and glue pot. If you have a powered jigsaw, your work is easy.

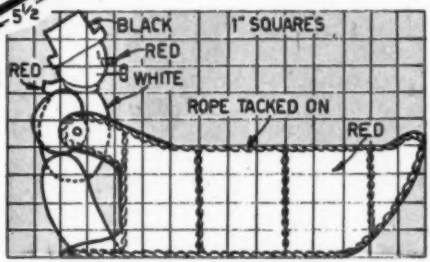


next step ¼" dowels 1½" long are glued in side; then slipped into holes in the matching section. After these sections have been joined, holes for the dowels to pass through are drilled in the other two sections (7⅝" at the base). Two ¼" dowels each 2¼" long are glued in one of these sections, the dowels passed through the holes in the 8" sections and into the piece on the other side. When all four pieces are fastened together, a hole is drilled in the top to accommodate a wooden star fastened to a ¼" dowel. Two disks are cut from ¾" stock, each 8" in diameter. A 1" section of ¼" dowel is glued in the top of

the lower disk and left protruding ½". Slots ¼"x¾" to form a cross are cut in the top of the upper disk and a ¼" hole drilled through. The tree is set in the notches in the upper disk and the latter set over the dowel glued in the lower one. A little [*Continued on page* 132]



SLED FOR CHRISTMAS COOKIES



Above: Sleigh candy box with snow man driver. Right, center: Santa swings like the man on the flying trapeze, waving mistletoe over unsuspecting ladies.

THE SCHOOL SHOP

Conducted by Gilbert Paust

Lieutenant, Civil Air Patrol, Westchester Squadron

How You Can Join The Army Aviation Cadet Training Program

THE United States is building the greatest Air Force in the world. For the past eleven months, we have been presenting in this section of MECHANIX ILLUSTRATED, aviation lessons in aerodynamics, civil air regulations and navigation to help you, who are really "air-minded," get that good ground training which every pilot needs. And we're going to continue these lessons, our next subject being *meteorology*, but this month I am going to digress to tell you about the Army Aviation Cadet Training Program and how you can put your "flying" knowledge to the best use in this branch of the service.

How would you like to be given the opportunity to sit before the Navigator's table of a Flying Fortress on that great day when the order comes through, "target for today—Tokio"! Or to bend over one of our precision bombsights with the bomb release in your hand, watching Hirohito's palace come in view! Or to sit in the "office" of a P-47 Thunderbolt with 2,000 "horses" at your fingertips and, in the sights of your six .50-cal. machine guns, one of Goering's Luftwaffe which once he boasted would rule the air! Yes, Uncle Sam is offering you a chance to be in on the "kill."

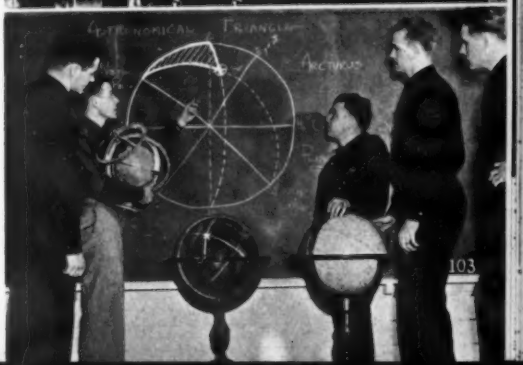
If you're a REAL American boy, over 17 but not yet 18 years of age, this is your opportunity to get into the Air Corps Enlisted Reserve and become one of the "Big Three" in aviation: Bombardiers, Pilots and Navigators are needed by the thousands to handle the countless numbers of Fighters and Bombers streaming off the assembly lines. Having enlisted, you continue your normal life as a civilian, living at home and going to school as usual, for you will not be called to active duty until the end of your first school term (or within six months) after you have become 18.

Your first step is to contact the nearest Aviation Cadet Examining Board. Entrance exams are easy.

At Randolph Field these basic training planes await their early morning assignment of Flying Cadets.

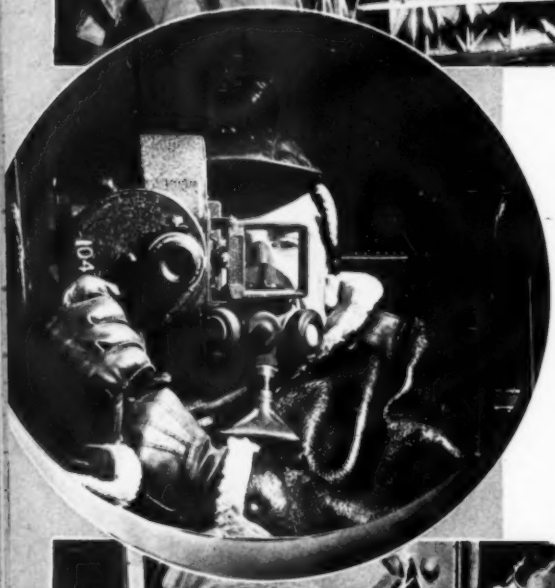
Now here's the pitch! First obtain written permission from your parents and then immediately get in touch with your nearest Aviation Cadet Examining Board. If you can't find it, contact the nearest Civil Air Patrol Headquarters or High School Victory Corps and you'll get all the help you need. You will be given a physical and mental exam and, as a member of the Air Corps Enlisted Reserve, you will be entitled to wear on your coat lapel the "AC" blue and silver wings, and let me tell you, you can hold your head way up and stick your chest way out when you get this pin! It's Uncle Sam's way of saying, "This guy is O.K."

A word about those exams you'll get at the Board! You don't have to be a "Captain Marvel" to pass them. Good health, of course, is necessary, but for the mental exam just plain, common sense is all you'll need. Remember, a background of mathematics, which



Cadets must know their powerplants and receive thorough training in theory of internal combustion engines. Navigators study celestial navigation.

The High School Victory Corps offers advice and training to the younger student of aviation.



includes Trigonometry, Advanced Algebra, Calculus, etc., is NOT necessary; you're going to *fly* a plane, not *design* one! If you can add 2 and 2 and get 4, you'll do. My experience has been that these fellows who are TOO smart don't make such hot pilots, anyhow.

Having completed your enlistment, get in touch with your Civil Air Patrol Squadron, if you haven't done so already. There you'll be enrolled as a Civil Air Patrol Cadet and will be entitled to wear the regular U. S. Army uniform with red

The job of the aerial photographer at left is an important one. Navigation Cadets study Tokyo.

The Bombardier Cadet must learn to become an expert "Egg layer." Practice bombs are used for training.

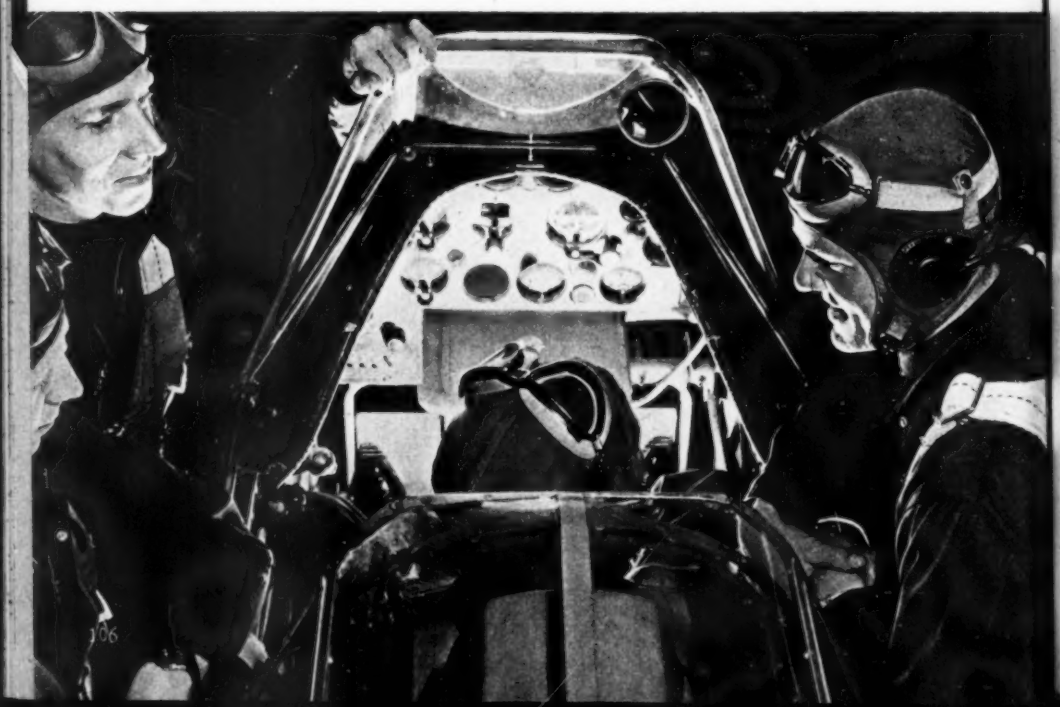
Bombardier Cadet climbs to nose through bomb racks. Notice how bombs are set one above the other ready for release as soon as bomb bay doors open.

shoulder straps of the CAP. You will be permitted to attend CAP close-order drill and navigation and code classes. These classes usually meet one evening each week. *This association with experienced pilots is an item which I cannot recommend too highly.* You'll learn to "talk" aviation, and you'll pick up some valuable DO's and DON'T's.

When you've reached 18 and are called to active duty, you will be ordered to Basic Training for a 5-week period at an Air Forces Technical Training Center where you'll learn to conduct yourself as a United States soldier. Then you're on the trail of those Silver Wings.

The first stop is college. There are approximately 154 colleges and universities offering preflight training, and you will be assigned to one of these. For 5 months you will be told all about civil air regulations, meteorology, navigation, elementary math, physics, modern history and military procedure. At some of these stations students receive 10 hours of flight training in co-operation with the Civil Aeronautics Administration. These studies aren't too difficult, but on the other hand, they aren't any "walk away" either. The government will be spending about $25,000 to train each one of you, and the plane which is in your dreams may cost $250,000. Therefore you will be expected to take your work seriously and prove worthy of your responsibility.

In Basic Training the Pilot Cadet must take off and land at night. Signal lights from field guide him.



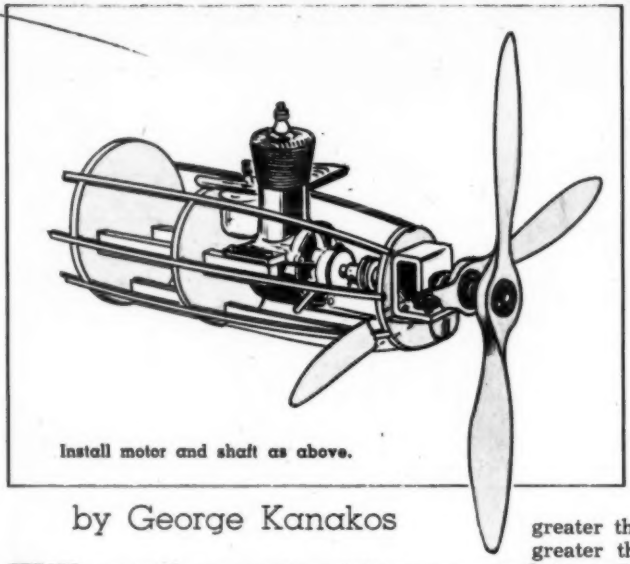
Having completed your preflight, you will be given that all-important Classification Exam to find your spot on the combat team. This exam of 150 questions (you will be required to answer 90 correctly) will give the Army a fairly good idea of your intelligence and ability to understand and follow directions. The questions are multiple-choice; you are given five answers to each question and are asked to pick out the correct one. In a Mechanical Aptitude Test your reaction time, judgement and ability to think quickly in an emergency are determined. For example, you are asked to hold a metal needle in a ¼" hole. If your hand trembles, the needle touches the side of the hole, establishes an electrical contact and . . . sparks fly. If you're normal, these tricks are simple.

The results of these tests will classify you as a Bombardier, Pilot or Navigator. We used to think that the Pilot was the hero of the skies; now we see in the latest war news that the Bombardiers and Navigators are equally worthy of praise. They do a lot of the "ball carrying" and get their share of Distinguished Flying Crosses and Air Medals. If you think you'd rather be a Pilot than one of the others, ask some Bombardier or Navigator which he would rather be. He'll tell you his job is best.

Then comes the [*Continued on page* 134]

This Bombardier's black eye is not the result of a practical joke. It is caused by charcoal which he rubs in place to keep stray light from the eyepiece.

These Pilot Cadets have completed Basic—are off for Advanced Training and those coveted silver wings.



Install motor and shaft as above.

CO-AXIAL PROPELLER For MODEL PLANES

This counter-rotating prop is simple and efficient and will bring your model up-to-date.

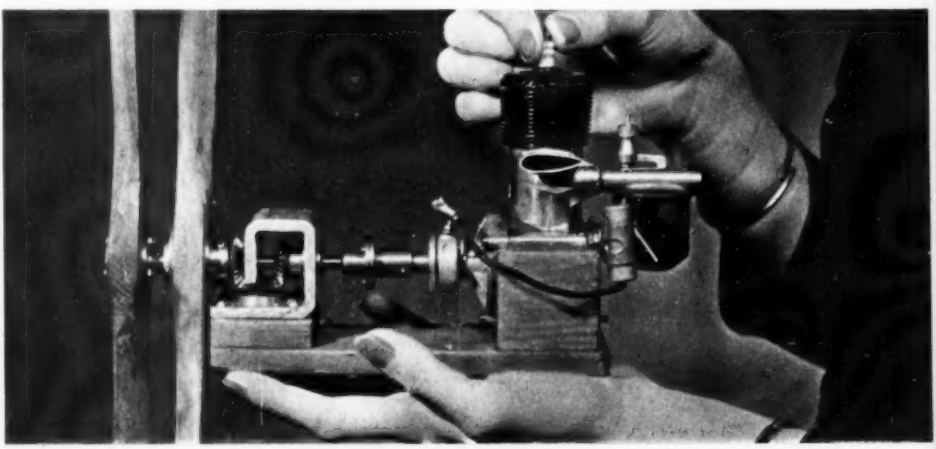
by George Kanakos

THE co-axial or counter-rotating propeller is the answer of the aviation engineer to the demand for bigger, more powerful and more efficient air screws to deliver the thrust of increasingly powerful engines. The conventional two-bladed prop was good enough for power plants below 1,000 horsepower, but with the development of units which could turn out 2,000 "horses" and more, a prop had to be found which could take full advantage of this additional power efficiently.

Experiments were performed with three-, four- and even six-bladed props, but of these only the three-bladed design has proved really satisfactory because of the fact that the greater the number of blades used, the greater the interference set up in the air between them. A four-bladed prop is used on the Republic P-47, while the Martin B-26 Marauder and the North American P-51 Mustang also employ this variety. On these ships a greater horsepower is delivered, but at the expense of decreased efficiency and objectionable torque.

There is also a limit to the length of the blades, for the longer the blade the greater the tip velocity, and when this tip velocity reaches the speed of sound, increased profile drag greatly lowers the efficiency. The P-47 uses a 12′ prop, but a four-bladed model 16′ 8″ in length is now being produced by the Curtiss-Wright Corporation.

The next step was the co-axial model, twin



propellers rotating in opposite directions. Although first designed in Italy, that nation was not quick to see its potentialities, and it remained for their former allies, the Japs, to develop it and use it on their super-fast Zeros. Our own engineers have experimented with it, but its exact status in our aviation is still in doubt. Of course its big advantage lies in the fact that it eliminates torque, and in this respect the model described here will be an asset to your flying jobs.

This co-axial mechanism is made of the usual machine-shop scrap with the exception of the gears and ball bearings, and the entire unit weighs 4½ oz. exclusive of the power plant. The setup consists of three brass miter gears (two driving gears and one idler) which are mounted in a housing of aluminum alloy. The rear miter gear is mounted on a magnesium drive shaft which is coupled to the power plant and drives the forward propeller. The forward miter gear is connected to the rear propeller flange which rotates on the drive shaft. Counter-rotation is accomplished by the idler gear which is mounted between the two driving gears as shown. All rotating parts are ball-bearing mounted. In place of magnesium, $\frac{3}{16}$" drill rod may be used for the drive shaft with no appreciable change in weight. Couplings are of mild steel, and housing of $\frac{3}{16}$" aluminum.

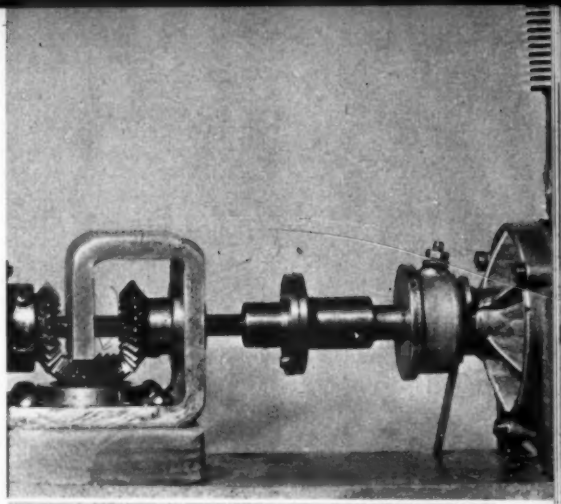
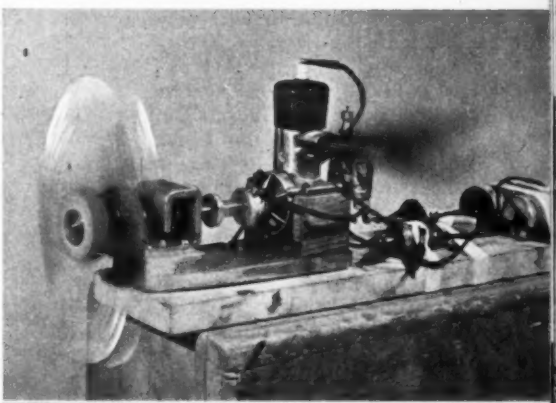
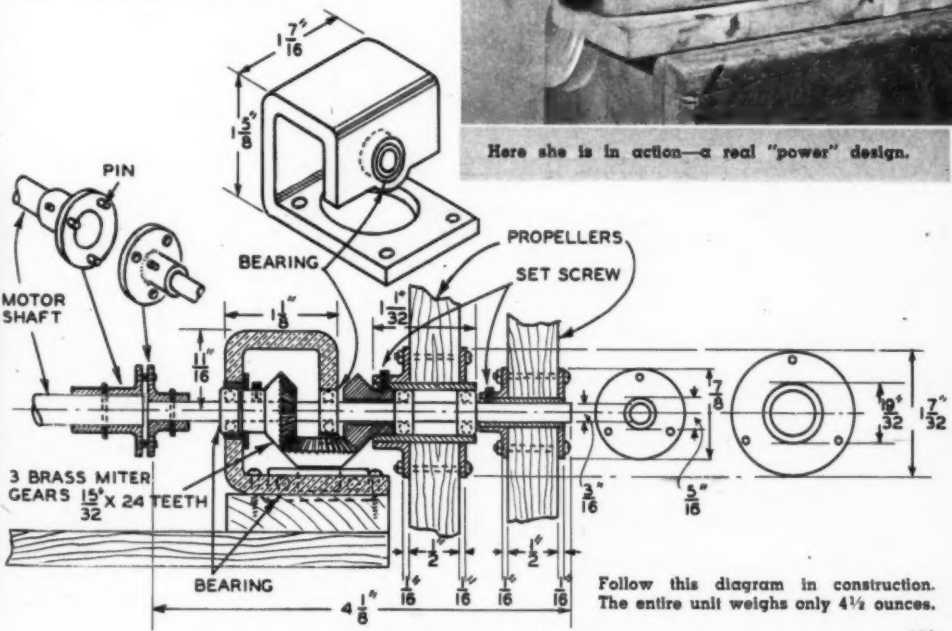


Photo above shows details of shaft and gears.



Here she is in action—a real "power" design.

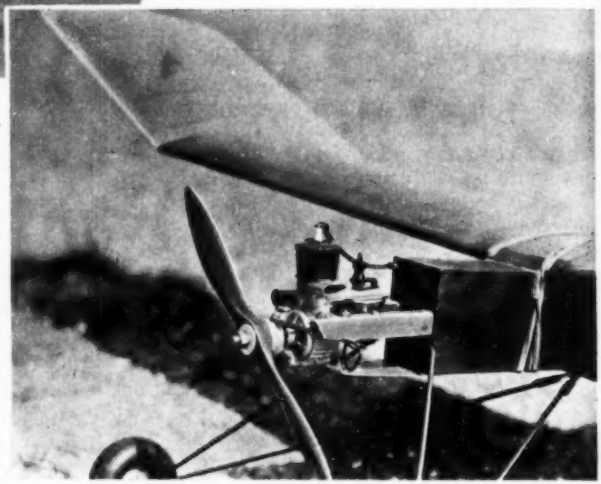


Follow this diagram in construction. The entire unit weighs only 4½ ounces.

30-MINUTE MODEL PLANE

This gas model established a real record—over 30 minutes with a 3-minute fuel supply. Build one like it and see what yours can do!

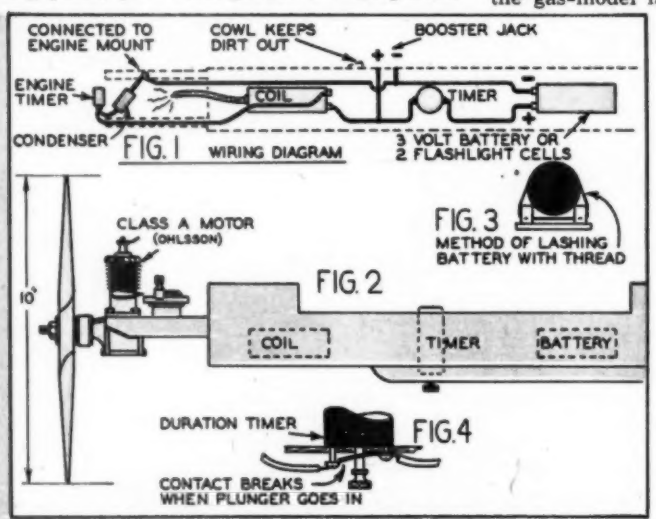
Class "A" motor furnishes power.



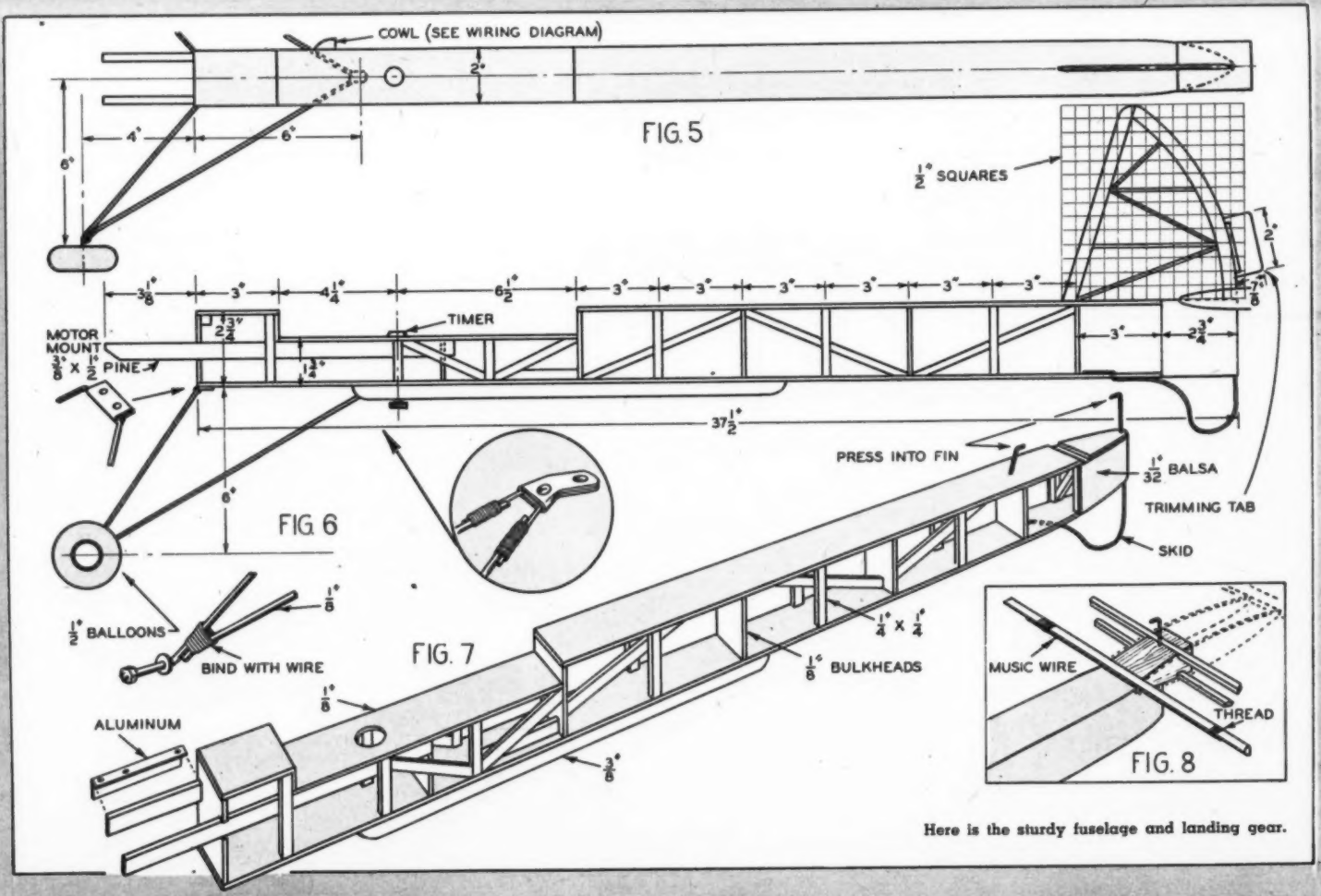
THIS original model distinguished itself on one of its early flights with a record of over 31 minutes in the air with only a 3-minute fuel supply. Immediately after launching, it spiraled gracefully directly over the starting point, but instead of coming down after the motor stopped it continued to ascend, having been caught in a thermal current which carried it up through a white cloud, and it landed 4 miles from the starting point. Only damage was a slight tear in the wing fabric.

Its design is patterned after no other existing plane, yet it has proved an exceptional performer. Construction details are similar to those of conventional models, with which the gas-model fan is familiar. Wiring diagram, Fig. 1, includes booster jack for starting with extra cells. A small cowl cut from an aluminum tube is installed just in front of the plug-in holes to protect them from dust or other matter. Relative positions of the battery, duration timer and coil are shown in Fig. 2. The arrangement of the contact breaker in the duration timer is shown in Fig. 4 and method of lashing battery or coil in Fig. 3.

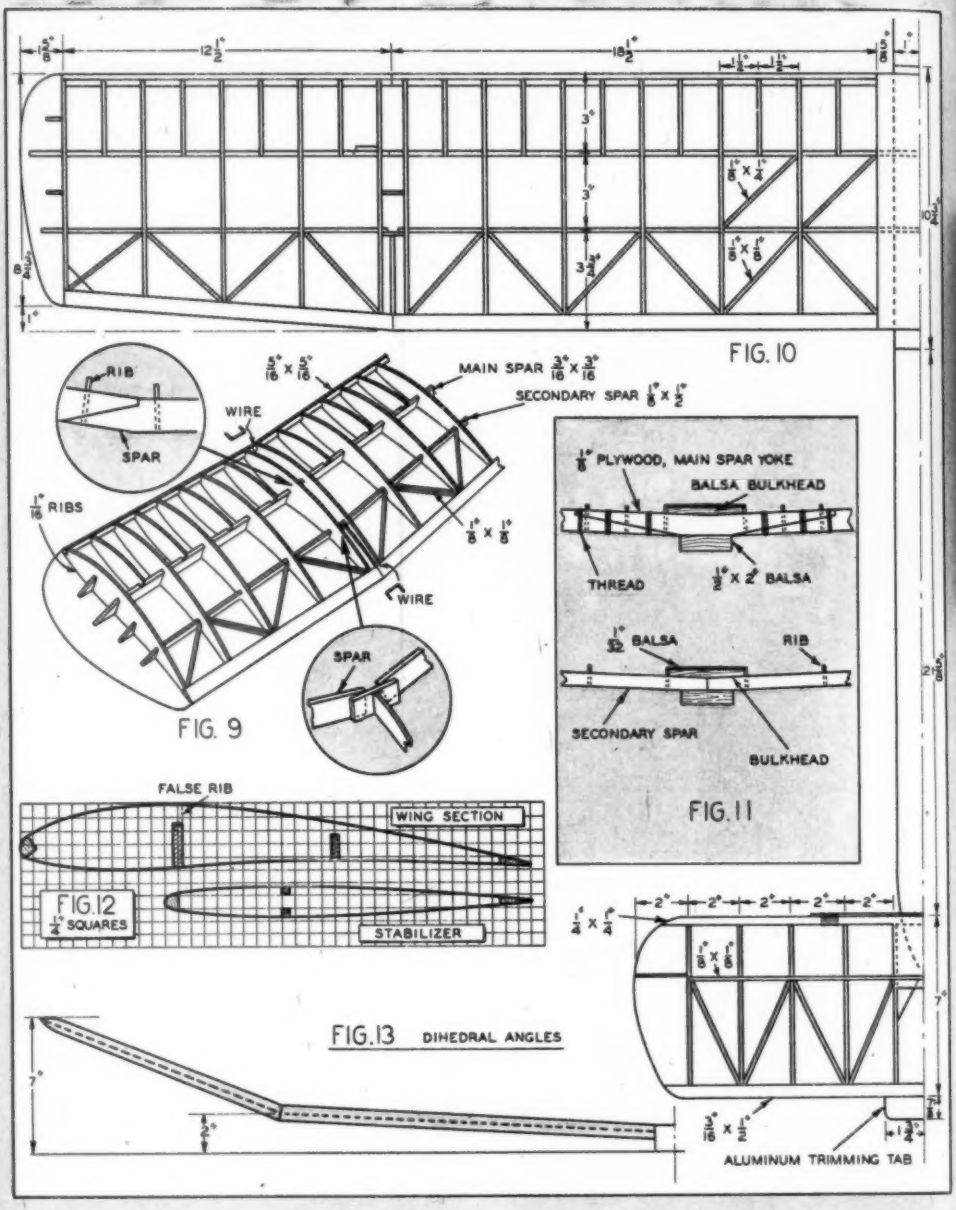
Plan and side view of fuselage are given in Fig. 5. Note that there is a drop



Engine hookup shown at left.



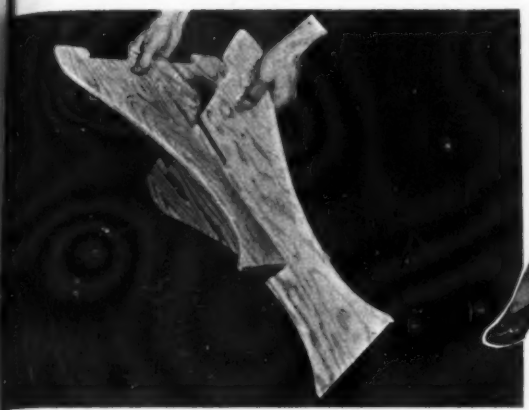
Here is the sturdy fuselage and landing gear.



This diagram shows construction details of wing, spar joints and stabilizer. Note double dihedral used in wing.

in the frame to receive the wing, and the end of the duration timer fits in a hole in the lower side of the wing support. A light but strong landing gear is made as in Fig. 6 with sufficient "give" for a tough landing. A wire skid is installed at the tail end. A perspective view, Fig. 7, shows details of construction and the bracing of the long and narrow fuselage. Motor supports of pine extend well back into the fuselage, and [*Continued on page* 140]

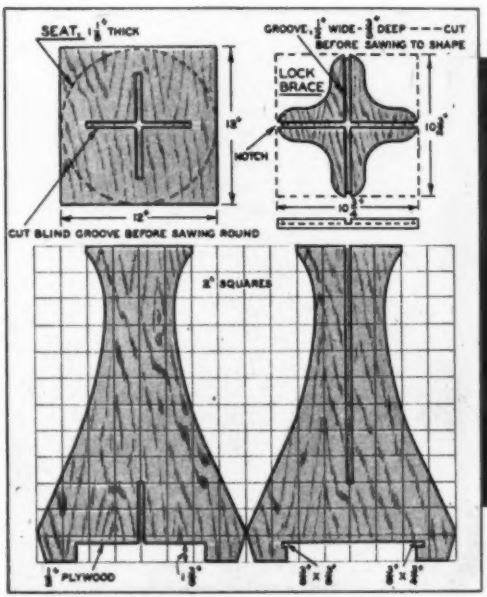
SELF-BRACING STOOL



The stool that locks itself together without glue or fastenings will find many uses around your home, in kitchen or workshop.

by Benjamin Nielsen

LIGHT, yet exceptionally strong, this modernly styled kitchen stool is constructed principally from plywood. It is unusually strong because of its self-locking brace. It is unique in that after the seat is glued in place no nails, screws or glue are needed elsewhere for its assembly. Pattern for legs is laid out on ½" plywood, then cut out on the bandsaw. Legs are cut out to same size and pattern with the exception of the slotted center and notched bottoms. The bottom ends and outer edges of the legs are nicely rounded.

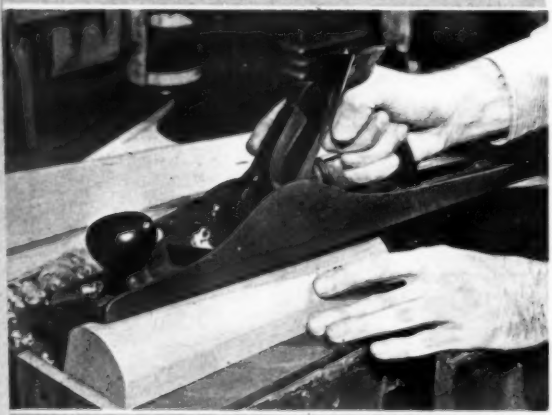


To assemble the parts legs are slipped together, then the locking brace inserted, as in photo above and at top left. Stool may be varnished or enameled.

SWINGING STATION FOR BIRD AIRWAYS

by Walter E. Burton

Filling the hopper of the bird feeder through a trap-door opening in the top. It's protected from weather.



The rounded nose is shaped from cypress with a plane. Below: Cutting one of the sidepieces on a bandsaw.

THIS wild bird feeder, which revolves with the wind to protect the feeding area from the weather, is made from plywood, sheet metal, and a few odds and ends. It is of the hopper type, and will hold several pounds of scratch feed.

Shape and dimensions are indicated in the photos and drawings. The feeder is streamlined and counterbalanced. For the "nose," make a block from 2″x2″ stock, rounding two of the edges with a plane so a curved surface will be presented to the wind. The other wooden parts, with the exception of the perch, are made from ¼″ plywood. Use a type that is bonded with waterproof adhesive.

In the top piece, directly over the hopper, cut a 4½″ circular opening for filling. It is necessary to make a weather-proof cover for this opening. This consists of a square of sheet metal bent at the edges to form a shallow tray about ½″ deep. Solder a pair of small brass hinges to one edge, and a brass washer extending over the opposite edge so the lid can be raised easily with a finger. Cut four ½″ square strips of wood and fasten them around the opening to form a frame over which the lid will fit. Fasten these strips with casein glue and nails, and arrange them so the sides are at an angle of 45 degrees with the feeder sides. This permits water to flow around the opening without running into it. Bend the edges of the copper cover inward at the front to hold it in a closed position.

The two vanes that enable the wind to swing the feeder are made of plywood or stiff galvanized iron. Like the rest of the feeder, they are protected with enamel or

The feeder is made almost entirely of ¼" plywood. This photo shows the feed hopper construction.

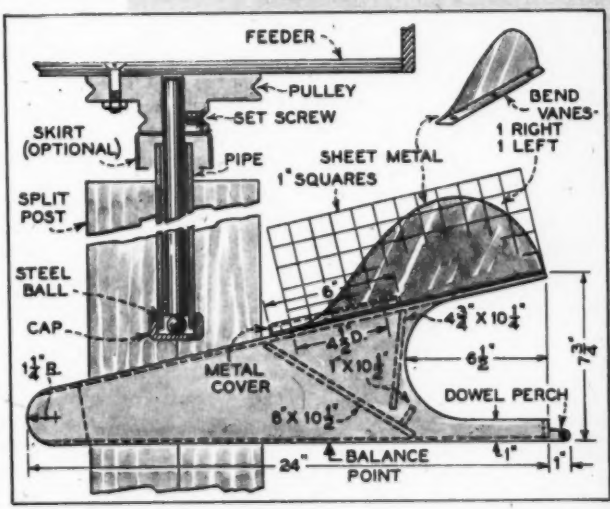
An old pulley form a mount for the ½" shaft. A piece of iron pipe with cap forms a socket for the shaft.

lacquer. The pivoting mechanism consists of a disk or pulley screwed to the bottom and drilled to receive a brass or steel shaft ½" in diameter.

The shaft is held with a setscrew. Its lower end rests in a socket made from a length of ½" iron pipe provided with a cap at the lower end. Inside the pipe is a hardened steel bearing ball on which the end of the shaft rests. Mount the socket in the post that supports the feeder, by making the post from two pieces of wood nailed together. The socket is sandwiched between these pieces, a cavity to accommodate it being hollowed out with a router bit or chisel. Put enough light oil in the socket to lubricate the shaft all the way to the top. If you desire, you can add a skirt, made from sheet copper or brass, at the top of the shaft to extend down around the socket an inch or so. This prevents rain from blowing in during violent storms. However, if the socket is kept filled with oil, little or no water damage will result when no skirt is used.

The perch along the front of the feeder is a length of ⅜" maple dowel rod. Additional perches can be attached to the sidepieces. In assembling the feeder, use casein glue or other waterproof adhesive and reinforce the joints with brads.

Above: Positions of vanes and watertight trap door. Former are of sheet metal. Dimensions are below.

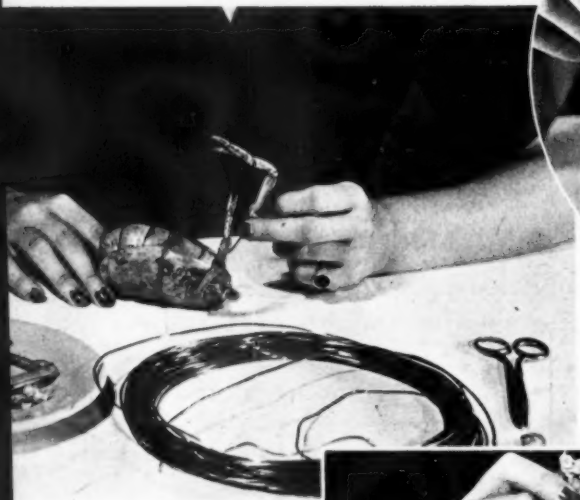


LOBSTER

PRACTICALLY everybody loves lobster—for eating purposes—but few people realize the crustacean's potentialities as a source of amusing handicraft. The shells must be preserved in a fairly intact condition for this little game, and if you're the type who leaves a pile of cracked-up ruins on your plate you'll just have to improve your technique.

Bridge party complete with kibitzer. The shells take paint well and may be colored in any desired fashion. Accessories and props can be obtained in the five-and-ten, or you can make them.

Here is what you need to make the figures: Shell of whole lobster; one nail; rubber band; wire; paper cement; plaster of paris; knife and scissors. First step (above) is to run nail through widest part of upper shell. Reverse lower shell and slide into upper to form torso.



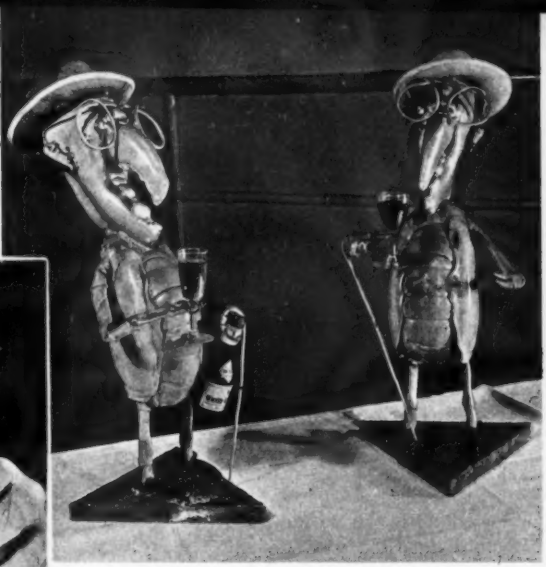
Above: Second step is to place elastic around shells, remove nail and run a wire about 6 inches long through the nail holes. Lobster legs are then slid on wire for arms of figure. Make legs for the figure in a similar manner.

Right: A small hole is cut in tip of one claw and a wire loop 10 inches long inserted. This goes into top of the body cavity to form the head.

PHOTOS BY CONSTANCE MITLER
FROM GRAPHIC HOUSE

LAUGHS

Below: Mix plaster of paris in saucer with a little water and fill shell. It's a good idea to remove appendages before doing this, and replacing them after plaster hardens.



Two convivial gentlemen are depicted in the little scene above (probably discussing the Fourth Term). Canes and eyeglasses are fashioned from the lobster's antennae; feet are glued to weighted bases.

Right: Face has lobster's original eyes and small bits of shell make shell-like ears, held to the side of the head with paper cement.

Final step is applying things like hair, facial expression and garments, and arranging your characters in a favorite tableau or other situation, like the little harem group seen at left.

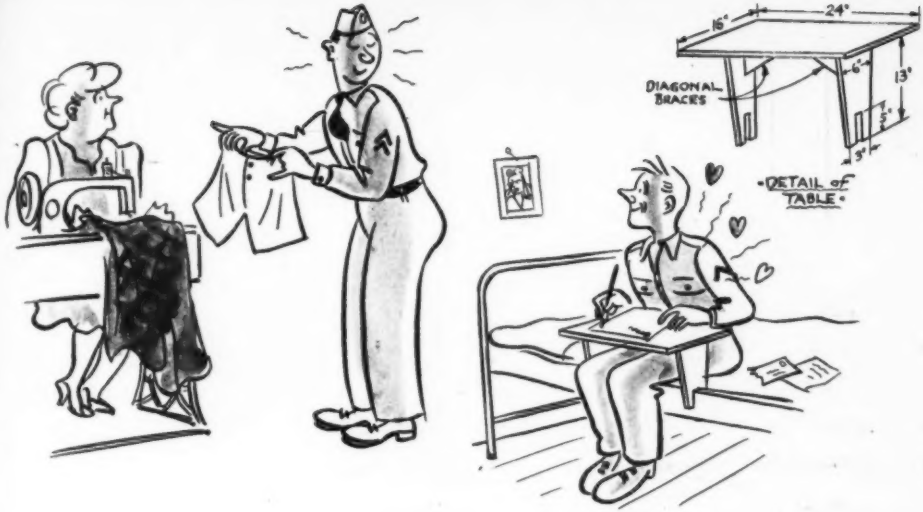
IDEAS FOR SERVICE MEN

PERHAPS it would be well at this time to explain, for the benefit of new readers, both in and out of the Armed Forces of the United States, just what this department is all about.

During the course of their service to their country, members of the Army, Navy, Marine and Air Corps run into many problems concerning their immediate lives and, being in the main endowed with the native American trait of "ingenuity"—the ability to solve the problem by one means or another—are constantly inventing ideas which are a great help to themselves and the other men with whom they are in immediate contact. Some of these personal problem solutions are effective and at the same time humorous, others have a touch of serious inventiveness about them, a few could probably make their creators real money if they could be applied to peacetime conditions, but all are typically American in their inspiration, and are of immediate use to other men in distant places who are going through similar tribulations.

If you, as a soldier, sailor, marine or flyer have discovered some "short cut" which has made a part of your life, however small, a little easier, won't you please tell us about it so we may pass it on to your unknown comrades who may be faced with the same thing? You'll find a box at the end of this department telling you how to go about it.

First on our list this month is an item sent in by Pvt. John J. Zecca, Jr., who's learning how to be a tank destroyer down at Camp Hood, Texas. Private Zecca has discovered that many of his fellow G. I.'s forget their dog tags after



taking a shower, and then have a tough time locating them later on. His solution is simple. Just put the dog tags in your shoes before you shower. If you don't find them when you put the shoes back on you should get a medical discharge for general numbness.

We now come to something really new to "Ideas for Service Men," though frankly, we can't see why, unless it's an oversight on our part for not adding "and Women" to the title. You guessed it—a WAC has given you a suggestion, and though the male section may not find it too exciting, we hope it will be an example for other gals in uniform. We'd like to hear from lots of them, and we know you would, too. Here goes:

AFC Kathryn M. Frick, who's stationed at the Aberdeen Proving Ground, Md., is the author of the idea, and she says, "I use the feet, cut from worn men's stockings to make a mit for shining my shoes. I cut them off above and below the heel, using the latter as padding, then sew the top of the stocking shut and put a draw-string in the cut-off end. My shoe kit is kept in this bag, and there is no fuss or smear when shining my shoes." Thanks, Kate, and we hope we'll hear from you again.

Next we have PFC Clement Canja of Brookley Field, Mobile, Ala., who says he has a definite improvement on the method used by Pvt. Townley in the June issue for cleaning mess tables when on K.P. Some of you may recall that Townley, after throwing rinse water on the table, twisted up a burlap bag and swished it the length of the table, thereby removing the excess moisture. PFC Canja says this method is crude and antiquated, and has been replaced in the better camps by wide squeegees, used in connection with a pitcher of warm water flavored with vinegar. Two swishes by one man armed with the squeegee do the trick. Anybody know any more table-drying stunts?

John F. Brush, Instructor, Navy AMM School, in Memphis, Tenn., comes up with this one: "Having seen what a problem it is to get clothes marked with a reliable mark that won't fade, I've devised a means of *stitching* identification on personal gear.

"Using a sewing machine threaded with a contrasting color thread, back off the tension on the presser foot and pencil the name lightly on the material as a guide. Then simply move the cloth under the traveling needle to spell out the word. Having the pressure off enables the cloth to be moved to and fro and sideways without turning it. The result is readable and lasting."

The next and last item must really be needed badly, because no less than three soldiers (widely separated) sent it in at once. Naturally, their versions differed slightly, but they were essentially the same, so we're showing you a more or less composite idea of all three. These men, each of whom will receive a check, are: Pvt. W. J. Williams, Davis Monthan Field, Tuscon, Arizona; Cpl. Ray J. Langston, Army Air Base, Muroc, Calif., and PFC Alfred A. La Voie, Fort Brady, Mich.

They all had the same trouble, which was, finding a handy place to write their letters in peace and quiet. Their collective solution was the designing [*Continued on page* 140]

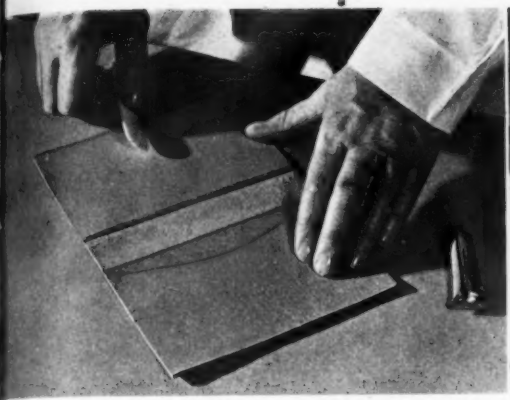
WALLET IN LEATHER

The wallet has three pockets and is a convenient size for carrying. Suggested dimensions are given at left, but may be varied according to intended use. Note tooling along edges.

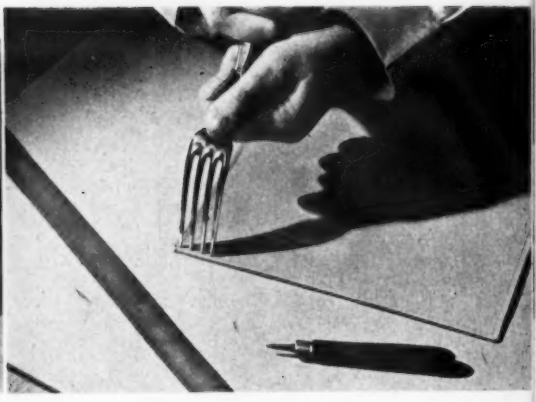
THE craft of leather working is probably one of the oldest of all, and has been practiced by every race, in many forms, almost always with skill and beauty. While the more intricate types of leather tooling and working are beyond the scope of the beginner or average hobbyist, many useful and attractive leather articles can be made with simple tools and no special knowledge.

The making of the handsome, bound-edged wallet or pocketbook illustrated above is told here, step-by-step, in pictures. Just equip yourself with a piece of leather, sharp knife and some sort of hole-puncher and you can duplicate it with ease.

Above: First step is to make paper patterns as guides for cutting wallet pieces from leather. Use a sharp knife and steel straight-edge for this. Lower left: Cardboard pattern guides tooling on the pocket. Below: Inner pocket is part cloth, glued to leather.

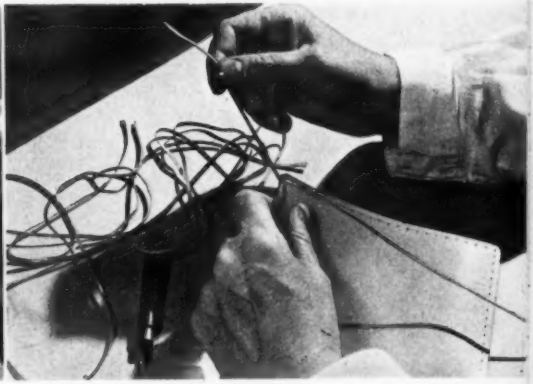


Pockets are glued along three outer edges to back piece, pressed well down with paper knife or spoon.

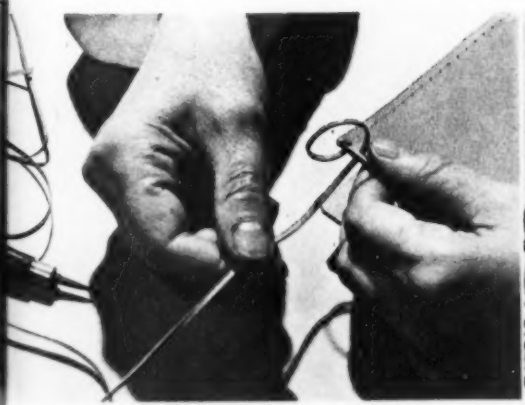


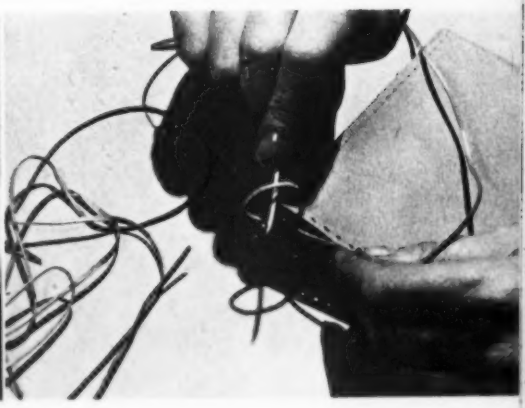
When glue has dried line is tooled around back near edge and perforation points marked in it with fork.

Above: Spots marked by fork are punched in. Below: Lacing, second step. Pull strip through next hole but do not tighten—leave a loop for the next stitch.

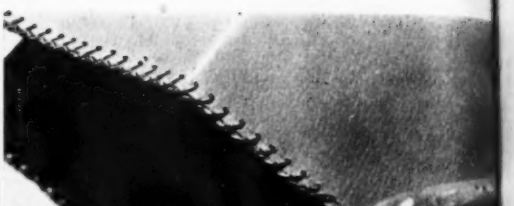


Above: Lacing, first step. Pull a leather strip (sharpened to point) through a corner hole. Below: Lacing, third step. Pull strip through loop. Tighten.

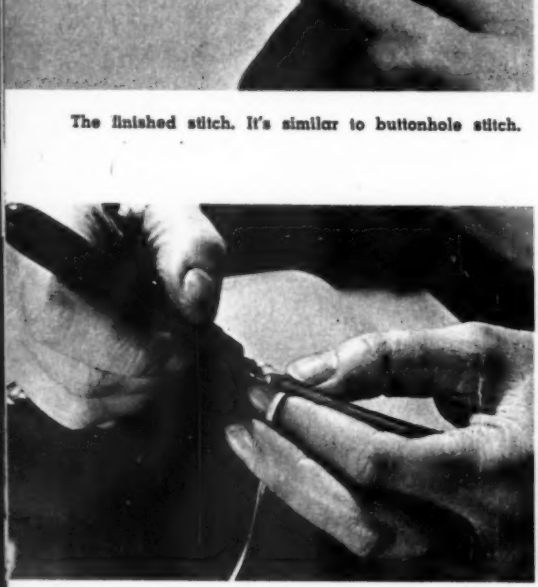




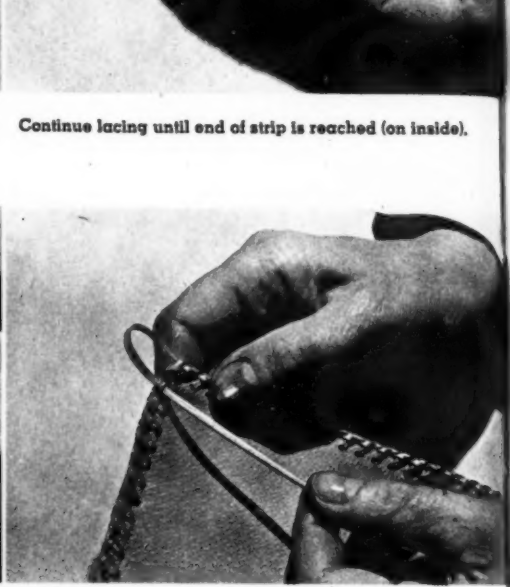
The finished stitch. It's similar to buttonhole stitch.



Continue lacing until end of strip is reached (on inside).



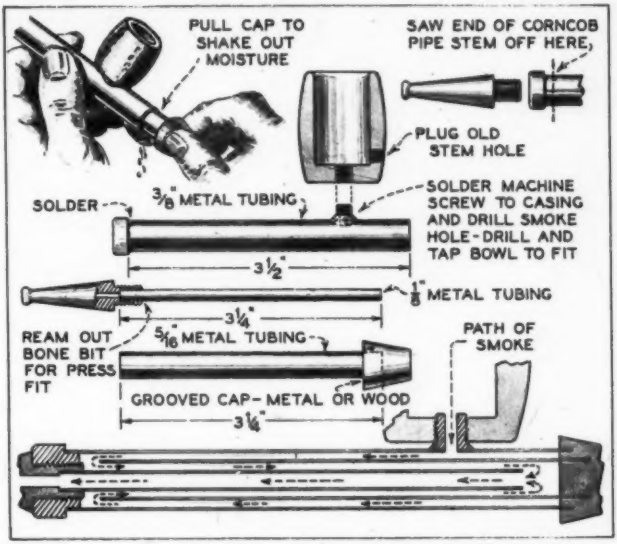
Above: New strip is threaded through next hole, pushed between edges of strip and glued down. Below: Finish of lacing. Pass end through first threaded hole to inside of wallet and glue down.



Above: Once lacing is completed around entire wallet, pull strip through first threaded stitch. Below: Finished wallet. This one is natural pigskin, but calf or pin seal are also attractive. Lacing may contrast.

MULTIPLE PASSAGE PIPE

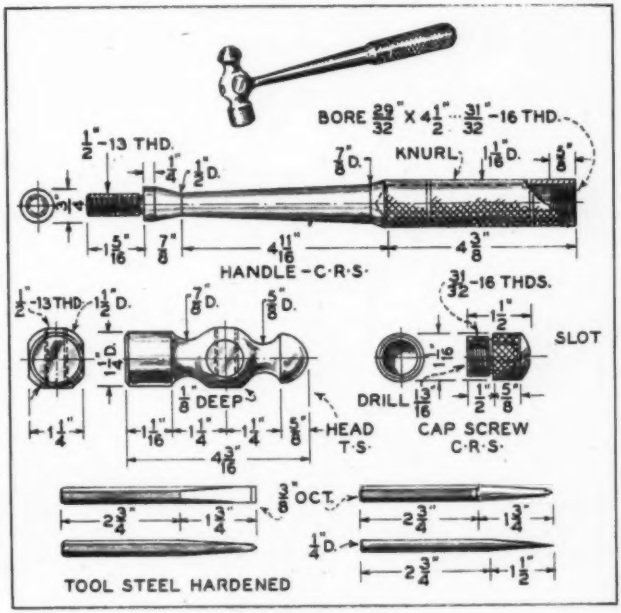
FROM the bowl and bit of a 10c corncob pipe and waste pieces of metal tubing, you can make this modern pipe which assures a cool and clean smoke by virtue of its multi-passage construction. As in an ultra-long-stemmed pipe, the smoke from the bowl must travel an extended distance before reaching the bit. This cools the smoke and condenses the sharp tasting moisture particles it otherwise would carry to the smoker's mouth.


PULL CAP TO SHAKE OUT MOISTURE
SAW END OF CORNCOB PIPE STEM OFF HERE
PLUG OLD STEM HOLE
SOLDER
3/8" METAL TUBING
SOLDER MACHINE SCREW TO CASING AND DRILL SMOKE HOLE - DRILL AND TAP BOWL TO FIT
3 1/2"
1/8" METAL TUBING
3 1/4"
REAM OUT BONE BIT FOR PRESS FIT
5/16" METAL TUBING
PATH OF SMOKE
GROOVED CAP - METAL OR WOOD
3 1/4"

Cut to length three pieces of thin wall tubing of the approximate dimensions shown. On the largest one, which serves as the casing of the pipe, solder the ferrule from the corncob and a short flat head machine screw in the positions indicated. Then drill a hole down through the length of the screw and through the casing. Now plug the stem hole of the corncob with a dowel and drill and tap a hole in its bottom to fit on the machine screw. (Extra bowls may be prepared to fit the pipe if it is desired to use several bowls [*Continued on page* 138]

ALL-METAL MACHINIST HAMMER KIT

THIS hammer kit is ideal for the machinist, especially for the bench mechanic or layout man who uses these four tools constantly. In the hollow handle are contained the chisel, center punch and scribe, and these may be obtained instantly simply by unscrewing the cap in the end. You can turn out the kit on your lathe; some scrap cold-rolled metal or old shafting will be the only stock necessary. Drill hole in head with 27/64 drill and after tapping, counterbore a ¾" hole, ⅛" deep. Make punch and chisel of ⅜" octagon tool steel, and the scribe of ¼" round. Harden and temper. Observe drawing for detail to give hammer a nice appearance. Handle and legs are knurled on the lathe.

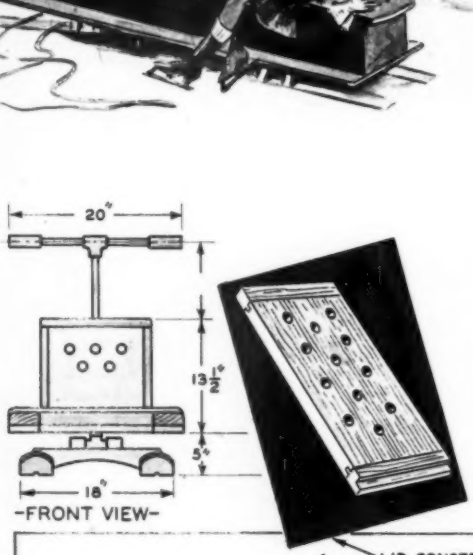


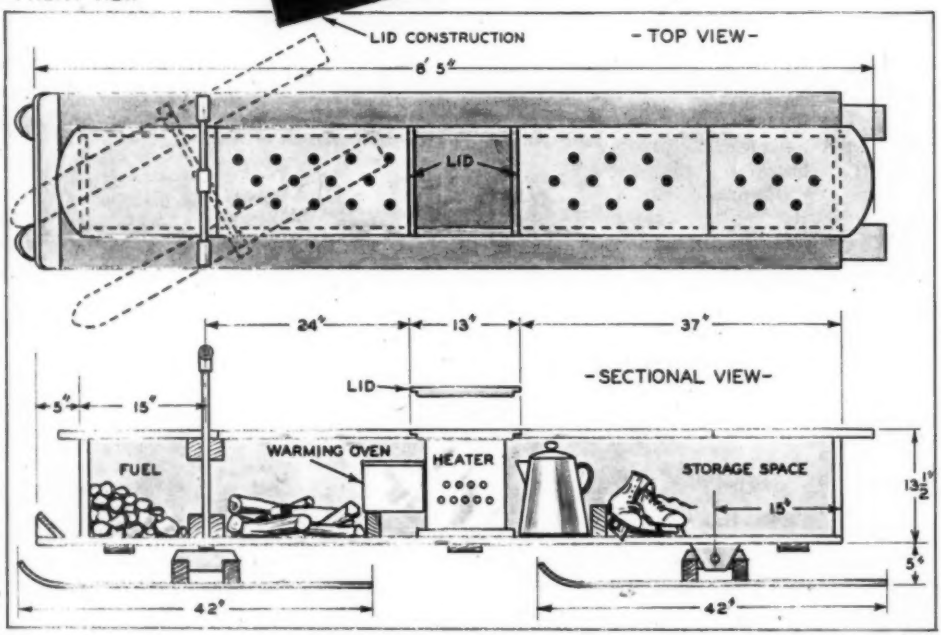
BARBECUE BO

No frostbitten toes and fingers at the next sledding or skating party if you have this sled! It even cooks hot dogs and coffee for you.

AFTER you have finished coasting, or want to rest a bit from skating, draw this unique sled to the side of the pond with back to the wind, lift off the panel over the gasoline-tin stove, stoke up the fire, boil the coffee and roast the hot dogs while you enjoy the warmth of the perforated seat. The stove, of course, is not meant to be lighted when coasting but it certainly is a great convenience and comfort during that pause for a snack.

Although the seat is higher than on the conventional bobsled, the ski runners are



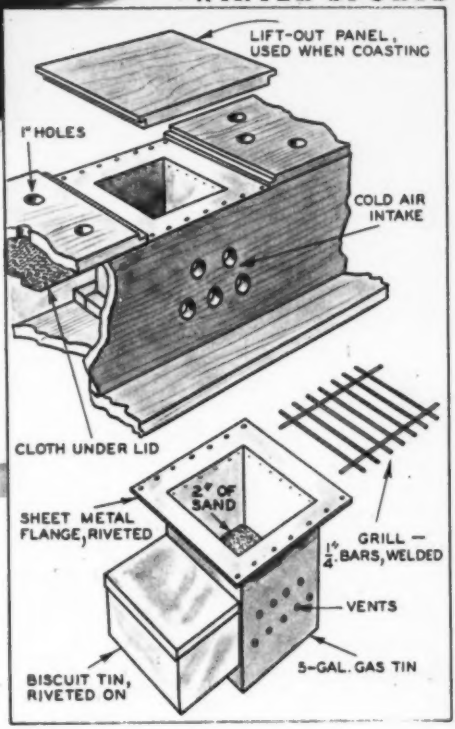


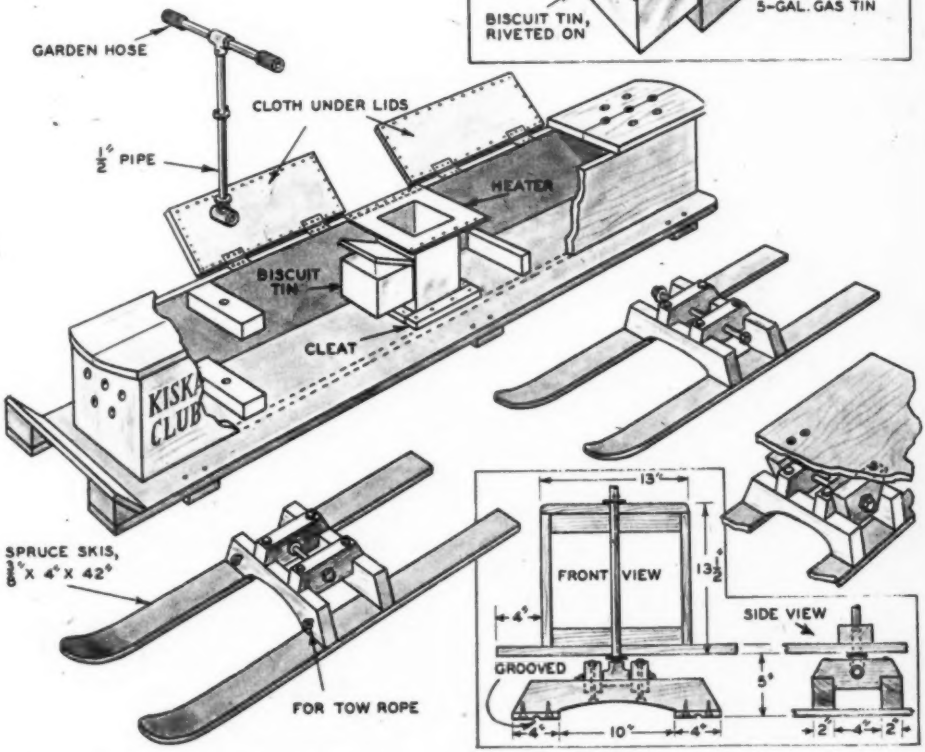
BOBSLED

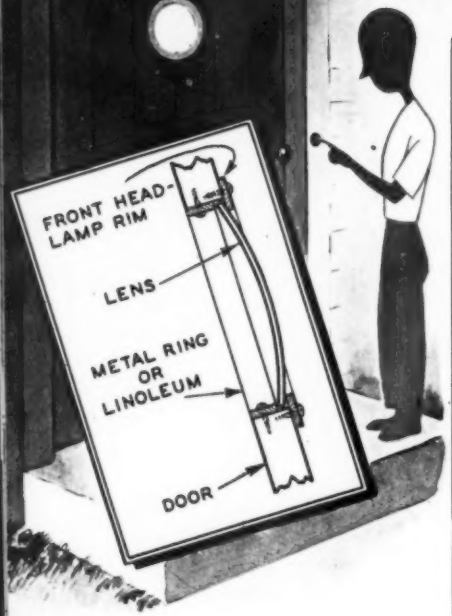
widely spaced to assure stability, and also this type of runner permits running on fairly soft snow.

The box-like chassis forms a heat chamber in which cold air enters against the stove and circulates toward the vents in the ends. With a brisk fire it is surprising how much warmth is generated. The seat top is bored with 1" holes, and a sheet of cloth is tacked beneath to prevent warm air escaping before it reaches the ends of the box.

[*Continued on page* 136]

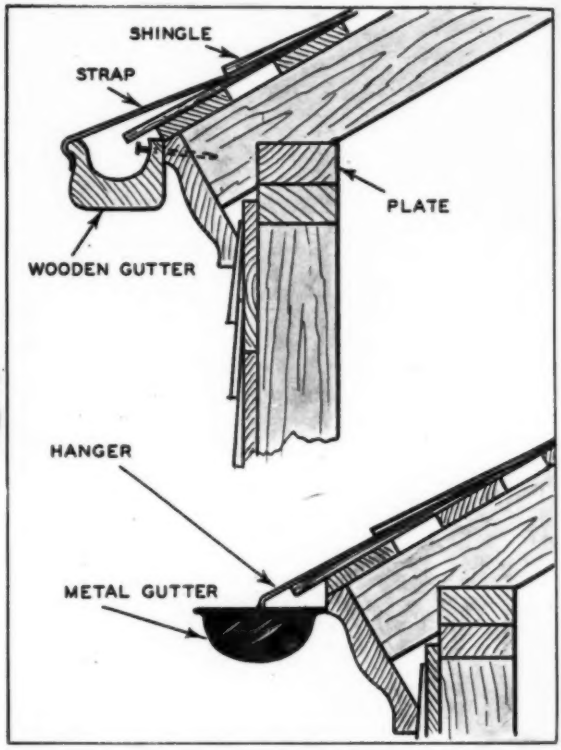






Transluscent Window For Door

A "PORT HOLE" type window made of a headlight lens and set in the door of a private or shower room will tell an outsider when the room is in use by transmitting light from within.



Installing Roof Gutters

IF WOODEN gutters are to be employed in making alterations on a house on in building a new one, it must be remembered that they must be put on *before* the roof is shingled and the siding is applied. Such gutters must be nailed into the structural framework of the house as shown above.

Spice Cabinet

HUNTING for spices and seasonings on crowded shelves is both annoying and time-consuming. Lucky is the housewife who has a small cabinet like the one shown, for it will keep all these items for her in one place, within easy reach and ready for selection. Make in tiers of scrap plywood.

AIDS

Handle For Eraser

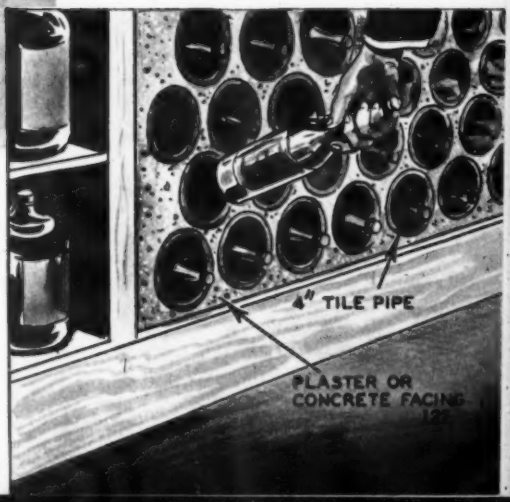
THIS simple handle for a typewriter eraser will take only a few minutes to make, but will prove to be quite a timesaver for the typist or draftsman to whom an eraser is a necessary item. Fasten the eraser tightly between the prongs of a clothespin with a machine screw

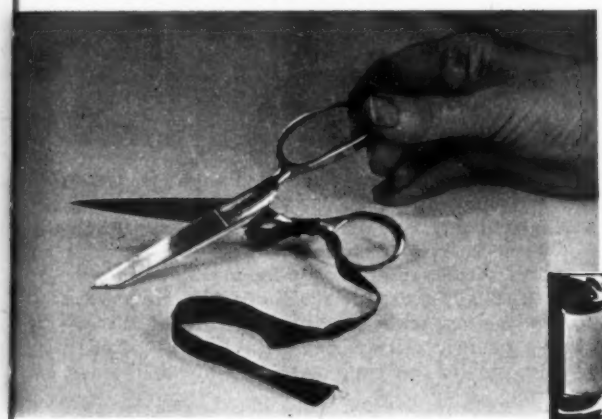
Improvised Gauge From Spool And Pencil

IN AN emergency you can fashion a simple gauge using only a spool, pencil and an ordinary carpet tack. Drive the tack through the pencil eraser, slip the spool over the pencil and hold as shown in the photo. Position of fingers determines width of gauge.

Bottle Bin For Wine Cellars

A BOTTLE bin made of common 4" tile pipe set in plaster or concrete facing as shown below will make a practical and attractive addition to a wine cellar. It holds wine bottles on their sides, thus keeping their corks wet as recommended by vintners for proper storage.





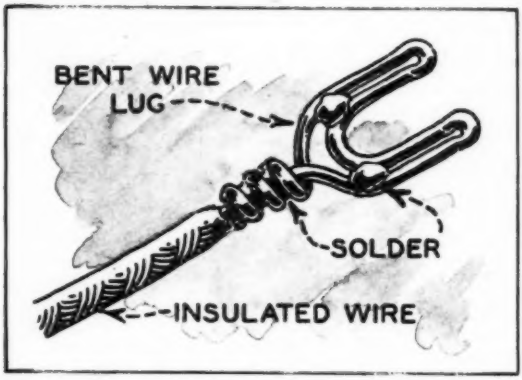
Find Scissors Easily

HERE is a kink which will interest the housewife who likes to sew. Tie a length of bright-colored ribbon to the handle of your scissors and they will be much easier to find in your sewing drawer or basket, even when partly buried under the sewing material.

RADIO IDEAS

Emergency "A" Battery For Portables

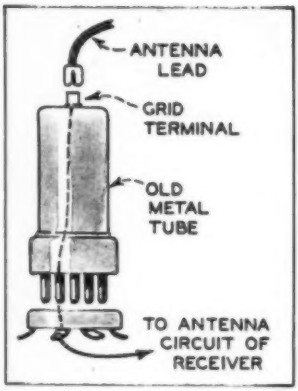
STANDARD flashlight batteries may be used for intermittent emergency service for most portable radios. The radio shown (left) uses 1½ volt tubes which is the regular voltage of flashlight cells. In this case the top or positive terminals are connected together and then to the positive lead to radio—likewise the bottoms of the cells are connected together and to the negative lead.



Lug Made Of The Wire End Itself

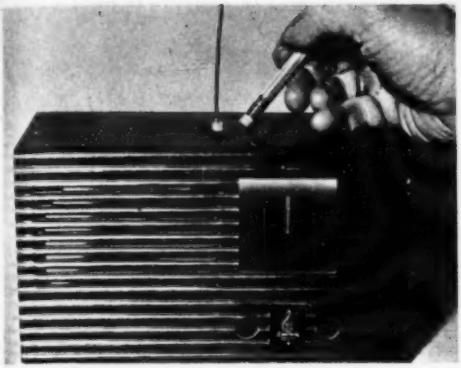
IF A wire lug is needed and you have none at hand you can fashion one of the wire end itself as shown above.

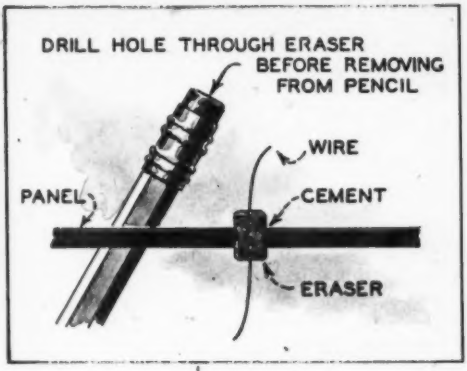
Clean the insulation from the wire for four or five inches, then double back, around in an arc and back again, as shown; finally twist the remaining end around the original start of the lug. With a small soldering iron or torch flame, fill a few points along the doubled wire with a bit of solder and then file or sandpaper off to a suitable finish.



Antenna Connection Through Old Tube

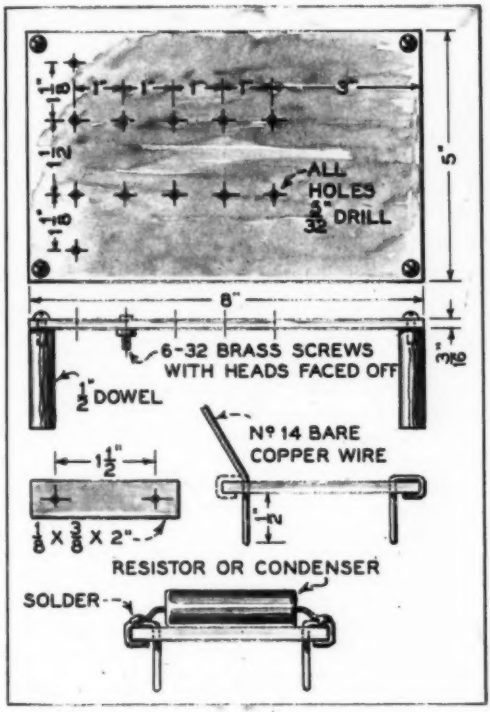
FOR quick antenna (or ground) connection to a radio an old metal tube with grid cap on top the shell can be used. Simply solder a grid cap to either the antenna or ground wire from the set. Then mount a socket for the tube mentioned inside the set and connect the grid prong to the antenna or ground circuit of the set. By pushing cap over grid terminal of tube, instantaneous connection can be made.—*L.B.R.*

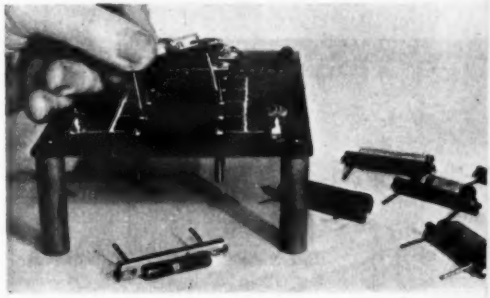




Feed Through Insulator

WHENEVER a small feed through insulator is wanted for antenna entrance to a small receiver or transmitter, or even for moderate power conveyance, a common pencil eraser can be used. Drill small hole through eraser and push wire through hole.





Panels For Measurements

ONE of the essential requirements of a radio training course is that the student have a thorough understanding of series and parallel combinations of resistors and condensers. The usual methods of twisting the lead wires together, or securing them under binding posts to make the desired combination often results in the lead wires breaking off so close to the unit that it has to be discarded. With resistors and condensers now in the hard-to-get class, and replacements in many cases virtually impossible, conservation of those items becomes a matter of major importance in the radio-training field.

The panels described here were first designed to use in a Signal Corps Radio Training class. Later their use was extended to twenty high schools where pre-induction radio courses are being offered. In every case the instructors have reported most favorably upon their use, not only in the matter of eliminating breakage of resistors and condensers, but also upon the ease with which the units may be inserted in or removed from the panels.

Any good insulating material such as bakelite, fibre, or pressedwood may be used for the [*Continued on page* 136]

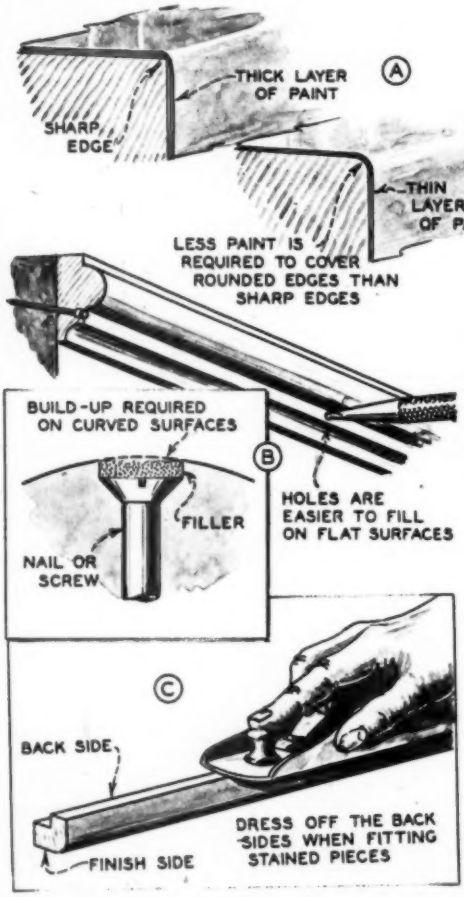
SAVE ON PAINTING

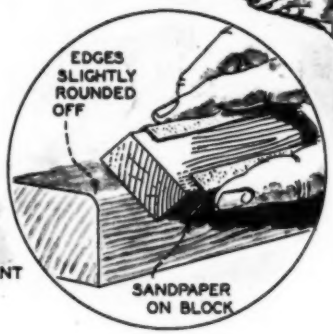
WITH CARPENTRY TRICKS

by J. Modroch

THE cost of preparing wood surfaces for painting can be appreciably reduced if certain steps in the carpentry work are planned with painting requirements in mind.

For example, more paint is required to effectively cover a board having knife-like edges than one on which the edges have been slightly rounded off as shown at *A*. A sharp edge offers no base for a thin layer of paint. Several coats must be applied to the surfaces leading to the edge before they are built up enough to cover it by overlapping. For this reason, edges should be bevelled or rounded slightly, making them as easy to coat with a thin layer of paint as a flat surface.





The ideas illustrated above may seem obvious, but they are often overlooked, with a resulting waste of time and money, as well as a less satisfactory job.

Nail and screw holes on a rounded surface are difficult to fill successfully. Filled holes can be made flush with the finished surface only by building up the filler in successive layers until its surface can be rounded to match the surface of the wood. Therefore, considerable painting time can be saved on jobs that involve the fastening of moldings and other shaped pieces if they are nailed or screwed through their flat surfaces instead of their round ones as illustrated at *B*.

Don't sand or plane off part of the surface of a stained piece of wood and expect to duplicate the original color tone by restaining. It is practically impossible to match the two so that the spot won't show. Accordingly, when mounting pieces of hardwood window casings, molding, and other trim that have been stained and filled beforehand, dress them off on the back sides, instead of the finished sides.

EVINRUDES ON THE HOME FRONT

help battle an enemy deadly as the Japs!

TREACHEROUS enemy of all mankind is the malaria-bearing *Anopheles* mosquito . . . dreaded alike in New Guinea's jungles and fox holes, and in many a sector of the home front.

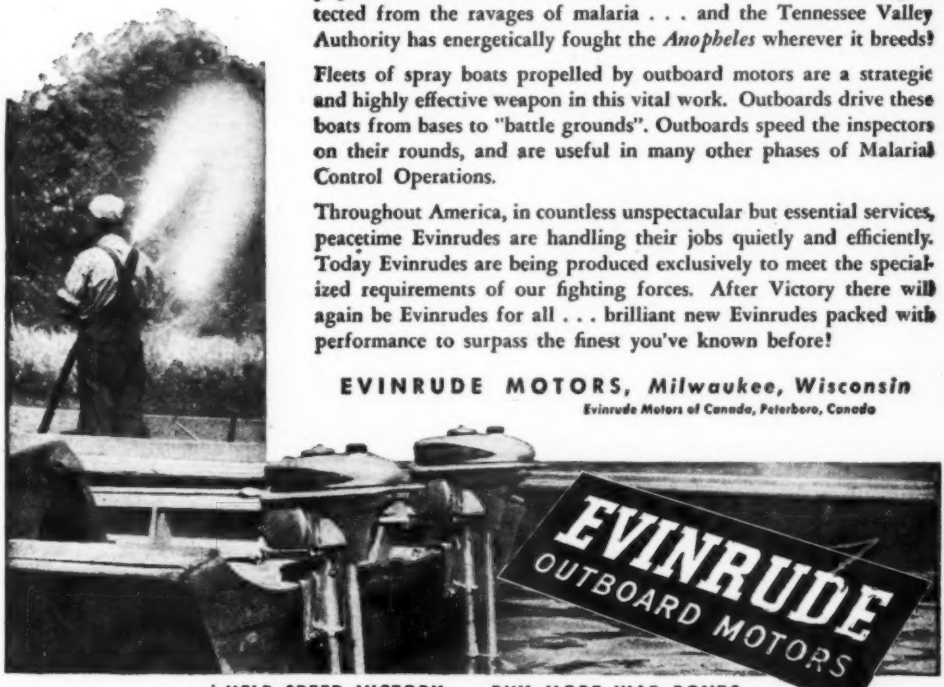
Along the placid back waters of Tennessee Valley's vast man-made lakes, the battle against *Anopheles* goes on endlessly. The war-busy population of this new industrial "Ruhr of America" must be protected from the ravages of malaria . . . and the Tennessee Valley Authority has energetically fought the *Anopheles* wherever it breeds!

Fleets of spray boats propelled by outboard motors are a strategic and highly effective weapon in this vital work. Outboards drive these boats from bases to "battle grounds". Outboards speed the inspectors on their rounds, and are useful in many other phases of Malarial Control Operations.

Throughout America, in countless unspectacular but essential services, peacetime Evinrudes are handling their jobs quietly and efficiently. Today Evinrudes are being produced exclusively to meet the specialized requirements of our fighting forces. After Victory there will again be Evinrudes for all . . . brilliant new Evinrudes packed with performance to surpass the finest you've known before!

EVINRUDE MOTORS, *Milwaukee, Wisconsin*

Evinrude Motors of Canada, Peterboro, Canada



★HELP SPEED VICTORY . . . BUY MORE WAR BONDS

Short Range Projection Box

[*Continued from page* 86]

strips glued or otherwise fastened in front of it. It is a good idea to arrange the screen so it can be removed easily, so the mirror may be reached for cleaning and adjusting, if there are no removable panels at the rear of the housing.

The outside of the viewer may be lacquered or finished by covering it with attractive paper. Or it may be left as is, if you don't mind the appearance of cardboard and gummed paper in their natural states.

The viewer may be used either in a vertical or horizontal position. In the vertical position, the viewing screen is at the top and sloped toward the rear of the projector. This is a comfortable viewing arrangement when the projector rests on a low table or stand. To support the viewer and elevate its mirror to the level of the projector lens axis, a wooden base is used. The one illustrated was made from two ¾" pieces of white pine, one measuring 7"x7" and the other 5"x7". Use a little glue to unite the cardboard and wood. For a vertical position of the screen, the viewer is laid on its side, and the rear or mirror end of the housing elevated by a piece of cardboard glued to the smallest rear surface, so the screen will be held perpendicular to the table surface. It may be necessary to block up the projector a little to bring the lens in line with the mirror. Since all projectors are not the same height, it is impossible to give dimensions that will suit all cases; but you can take the projector into consideration when laying out the viewer housing. The projector shown in the photographs uses a lens of 4" focal length.

To kill reflections, paint the interior surface of the viewer, especially the area around the outside of the viewing screen, with black drawing ink or with a dull-surface black paint. Preparations used for producing blackboard surfaces on wood, etc., are excellent.

This viewer works best in a darkened room, but reasonably clear images are produced in subdued light. For special purposes, a hood with eye holes could be fitted around the screen end. This would limit viewing to one person at a time.

When first setting up the viewer, you will have to adjust the mirror until the image is centered on the screen when the hole opposite the lens is squarely aligned with the projector. Thereafter, all that is necessary to line up the viewer is to swing it until the image is centered. And of course, you must insert the slide so its image appears in correct position on the screen.

Because of the shortened throw or projection distance, it is necessary to move the projector lens well out from the slide. Sometimes the projector focusing adjustment will not permit this. That is, the image cannot be made small enough by lens adjustment to permit use of a viewer of convenient size. In such a case, place in front of the projector lens an auxiliary positive lens of rather long focus. A 1-diopter or a 40" spectacle lens will do the trick in many cases. You can obtain such lenses from a pair of cheap eyeglasses. Pick the largest diameter available, say 40 mm. By using such a lens, it is possible to reduce the image so a viewer of much smaller size than that illustrated can be used. The lens may be mounted in a cardboard cap that slips over the projector lens or secured in position with bits of adhesive tape. Still another way, and probably the best when the projector lens is placed against the hole in the viewer, is to mount the lens permanently over the hole with adhesive tape, gummed paper, or drops of glue.

Novelties For Christmas

[*Continued from page* 101]

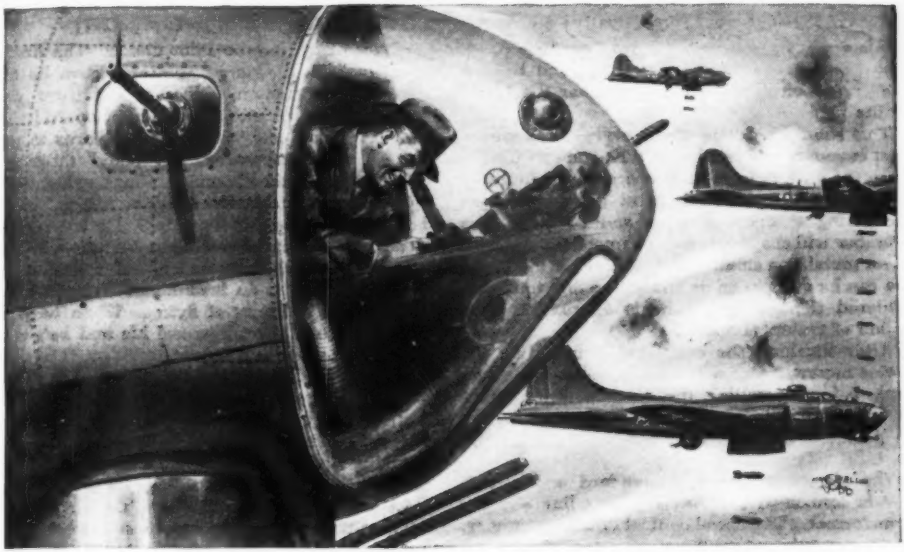
tube oil color is mixed with some kerosene and the tree stained green, the base red. Shellac is brushed on after the stain has dried. The star is silver. Christmas bells are tied in above the holes in the tree, and as your Christmas cards arrive, each is set in a slot.

GLASS TRAY AND COOKY SERVER—This novelty holds four glasses in a row and cookies having holes in the center, or pretzels. The tray is a section of 1" surfaced stock 3¼"x14" with the corners cut off and two half circles of ¾" stock nailed at each end. A depression to hold the glasses is chiseled 2¼"x10½", ¼" deep rounded at the ends. Snow men are jigsawed from 1" surfaced stock, sections of ¼" dowel noses glued in their faces, a hole drilled through the arms, and a 9½" length of ¼" dowel glued in. The snow men are nailed to the back of the tray.

SLED FOR CHRISTMAS COOKIES—The body, arms, and legs of the snow man are sawed from ¾" stock or 1" surfaced pine, nailed together, and a ¼" hole drilled through the hands and body. The sides, bottom, and ends of the sled are cut from ¼" stock and nailed together; then the snow man is set between the handles and a ¼" dowel glued through the hands and body and into the handles of the sled. The sled is stained red and shellacked; the snow man painted white, the hat black; the nose and scarf red. Rope is tacked on the outside of the sled.

MISTLETOE HOLDER—Santa Claus is traced to ½" stock, jigsawed out, and a round nose cut from the same stock is nailed to the face. He is painted red, white, and black, and a hole drilled in one hand so he may hang from the ceiling. A paper clip is tacked to the other hand to hold a sprig of mistletoe.

The white cliffs of Dover are chalk rock composed of myriads of tiny shells of microscopic sea creatures that lived on the ocean floor ages ago.



THIS IS YOU IN A BOMBER!

Yes—there you are in the nose of a Fortress—about to release ten tons of "eggs" on a Jap ammunition dump in the Caroline Islands!

Of course, you can't *really* be there in person. But you *are* represented there! The bonds you bought helped to build this Fortress . . . to pay for the bombs . . . to train the crew.

And just as these bomber crews go on hammering at Hirohito until their job is done . . . you will go on buying more bonds, saving scrap, giving blood, until final Victory is won.

Only then can we all enjoy the many startling improvements and innovations that will result from wartime research and experience.

Only then can American industry show what it has learned these past few years.

For instance, if you're a camera enthusiast, Universal will offer finer-than-ever cameras at prices well within your means. The experience gained in furnishing the Army, Navy, Marines and United Nations with precision optical equipment will open new horizons after Victory.

But in the meantime there's only one way to make that Victory—those better times—possible. That's by everyone of us backing every bomber . . . every tank . . . every sub . . . with everything we've got.

Make doubly sure of *your* place in that bomber—today!

ARMY E NAVY

There's only one flag we're prouder of!

UNIVERSAL CAMERA CORPORATION

NEW YORK • CHICAGO • HOLLYWOOD

Makers of Precision Photographic and Optical Instruments • Peacetime Manufacturers of Cinemaster, Mercury, Corsair Cameras

Home Humidifier

[*Continued from page 95*]

brads are left projecting about ½" and the cotton dishrag is stretched across the top and back of the draft board, high enough to clear the blades of the fan.

This should be done about every three weeks, as it becomes encrusted with dust and dirt filtered from the air and loses its evaporating qualities.

The metal water tank is of galvanized iron, measuring 4" deep, 5" wide and 18" long. Any plumber will shape this compartment for you from sheet metal at a small charge, although the bending can be done in an ordinary vise and the joints soldered tight. The can holds approximately a gallon of water. (Imperial.)

After finishing the cabinet and installing the motor mount, lower wall and lid, insert the water tank before installing the forward draft board as measurements are close and the tank cannot be placed into position after mounting the other part.

The electric switch is a standard wall switch and is connected between the light line and the transformer. The speed control of the humidifier, also mounted on the motor mount, is the heater regulator belonging to the car heater equipment.

Filling the water compartment is only a matter of swinging the humidifier around, opening the lid and pouring water from a quart bottle into the metal can. The draft board is used as a guide in pouring, as the lower part of this hangs into the tank by about an inch.

In operating the humidifier, be careful not to speed up the motor to the point where the spray is so heavy from the belt that water collects in the bottom of the cabinet. There should be just enough water thrown to keep the blanket wet, the draft board serving as a drip guide into the tank. If the draft from the fan seems to be about right but too much water is being thrown, this can be corrected without cutting down the speed of the fan by cutting a new and heavier belt which will not rotate as fast.

With slight changes in design, the evaporating speed of the humidifier can be increased if it is remembered that speed of evaporation depends on only three factors in the case of water—the size of the blanket or area of the evaporating surface—the amount of air passing over or through this area—and the temperature of that air. The gallon a day figure for this model is taken from poor operating conditions, with the humidifier placed with its back against a wall, thereby cutting down the free flow of air into the back. Evaporation can be increased considerably by placing the humidifier in front of a radiator, where warmer air and a freer flow can be obtained.

Food habits of birds can be told from their bills —a hooked upper beak, for example, shows the bird is fiercely fond of meat.

The School Shop

[*Continued from page 107*]

flight training for the Pilot Cadet. The first lap is 9 weeks of *Primary Training*. Here he takes his dual instruction, soloes in the third week, learns the chandelle, loop and snap-roll. The next stage is *Basic Training*. He learns to put a $20,000, 450-horsepower "sky pony" through its paces. Night takeoffs and landings, spins, formation flying, etc., are part of his activities. Finally he reaches *Advanced Training*. He has 10 hours of aircraft and naval vessel identification, 10 hours of navigation, 10 hours on bomber armament and AA fire, 10 hours on instrument flight in a Link trainer and 70 hours of flying. When he passes his test, the silver wings are his and he's ready to take his crack at the Axis.

For the Bombardier Cadet, training is equally exciting. He starts as a "pullet," but it isn't long before he becomes a real "egg-layer." After studying elementary navigation, he starts his bombing in an elongated chair 12' up on a motorized platform, adjusting his sight on an electrically operated "bug" on the floor below. All his textbooks are locked in a safe; taking notes is forbidden. Their information is strictly confidential. At the end of his training period, the results of his studies are considered. He has won his bombardier's wings and is rarin' to go.

The 18-week course of the Navigator Cadet is chuck full of map-reading, dead-reckoning and celestial navigation. The sextant, plotter and computer become the tools of his trade. He plots courses and reciprocal courses, and near the end of his training period he finds that he has flown approximately 15,000 miles. He can direct his bomber to every Axis stronghold on the face of the earth. He proudly wears a navigator's wings above the pocket of his uniform.

These three make the team which will blast the enemy. With their Gunners, Radio Operator and Ground Crew they will operate as a unit to bring the United States to victory.

Remember, the nearest Aviation Cadet Examining Board holds the answer to your country's future as well as your own. You alone have the physical fitness, mental alertness and personal daring to meet the acid test for air crews of high-powered military aircraft. The pilots of today will lay the foundation for the aviation of tomorrow.

(Next Month: Meteorology, Aviation Lesson No. 12—*Cloud Types and Formations*).

Under red light the average person will judge weight as heavier; under green and blue lights there is a tendency to judge them as being lighter.

The non-nutritive water content of fruits and vegetables is 75% to 95%.

The Adirondack Mountains are approximately 1,100,000,000 years old.

"and now...Good Luck and Good Hunting"

This is the day I've looked forward to since I was seventeen . . . this is the day I win my wings.

Mom and Dad are waiting there. Dad's standing tense and straight and tall, and his face looks proud and grim, as though the General were talking to *him*.

". . . they tell me you're hot pilots and navigators and bombardiers. And it is well you are. . ."

As we marched in, Mom waved and I caught the white flutter of her handkerchief out of the corner of my eye. In a moment or two she's going to cry—just a little—like she did the night we talked it all out, she and Dad and I, when I told them I wanted to fly.

". . . to your families, I say—ours is the safest military flying of any of the world's air forces."

And now here on the parade grounds, with the shadows falling and the bright flag whipping in the sky, I remember Dad said, "Son, your Mother and I won't stand in your way. If this is what you want to do—do it with all your heart and soul and God be with you. I wish I were your age—so *I* could fly and fight."

"And I say to you cadets, get the enemy in your sights and let him have it . . ."

Now, in just a minute, we'll right face and walk up to the platform under the flag. And the General will hand me the parchment, and then he'll pin silver wings on my blouse and return my proud salute.

"The world has never before seen a team like the Army Air Forces . . ."

Thinking of all the days and nights packed with hard work . . . our college training . . . the numberless flights with patient instructors . . . the painstaking way we were taught to fly safely on instruments, how, flying wing tip to wing tip, we were brought together closer than brothers . . . I understand what our General means. The Army Air Forces are more than planes, more than men, more than machines—a *great team* with one aim, one object, one goal.

". . . to sweep the skies clear, so free men may walk with their heads up and without fear . . ."

And as the last man receives his wings and the gun booms out and we stand retreat and the flag comes slowly down, I'll thank God *my* father and mother gave me the chance to win my wings . . . belong to the greatest group who ever fought or flew . . . gave me a future and a career!

"And now, gentlemen, we have work to do—and I leave you . . . good luck—and good hunting."

If You are 17. . . Go to your nearest Aviation Cadet Examining Board today . . . if you can qualify for the Air Corps Enlisted Reserve, you will receive Enlisted Reserve insignia but will not be called for training until you are 18 or over.

When called, you'll be given 5 months' training (after a brief conditioning period) in one of America's finest colleges . . . then go on to eight months of full flight training. When you graduate as a Bombardier, Navigator or Pilot—you will receive an extra $250 uniform allowance and your pay will be $246 to $327 per month.

Meanwhile. . . you should see your local Civil Air Patrol officers about taking C.A.P. Cadet Training—also your High School principal or adviser about the recommended courses of the Air Service Division of the H. S. Victory Corps. Both will afford you valuable pre-aviation training.

(Essential workers in War Industry or Agriculture—do not apply)

U. S. ARMY RECRUITING SERVICE

"Nothing'll Stop the Army Air Corps"

"KEEP'EM FLYING!"

For information regarding Naval Aviation Cadet Training, apply at any Naval Aviation Cadet Selection Board or any Naval Recruiting Station; or, if you are in the Navy, Marine Corps or Coast Guard, apply through your commanding officer . . . This advertisement has the approval of the Joint Army Navy Personnel Board.

Barbecue Bobsled

[*Continued from page* 125]

The sled, when used for a bench, should be located with the right side against the wind. For the stove cut the top from a five-gallon oil can, punch holes 3" above the bottom on the sides for draft, and rivet a flange on the top as shown. A biscuit tin riveted to one side will serve as an oven to keep buns warm. Cleats around the bottom separate the stove from the walls, permitting entrance of cold air which, when heated, flows toward the ends of the seat-box. A simple grill can be made from iron rods or from a discarded oven-grill cut down to size. Fuel is stored forward; coffee pot, skates, extra mittens or sweaters are stored in the rear.

The ski runners are made of spruce, hickory or oak, the forward ends steamed and bent up in a form. A groove should be cut in the bottom. An iron pipe with tees on each end serves as a steering post, and the handlebar is insulated with short pieces of old garden hose. This type of steering with the foot brace gives good control. Short lengths of pipe make excellent bearings for the steering post and at least two or three washers or a ball thrust bearing should be put on the bottom.

Panels For Measurements

[*Continued from page* 129]

panels. Two such panels will be required, one for the parallel circuit and one for the series circuit. Lay out and drill both panels, all holes 5/32". Inscribe the circuit lines and corresponding formula on each panel. These may be made with ink, but white poster paint is recommended where it is desired to have the markings stand out. (See photo.) The markings on the panels may be made permanent by coating them with shellac or clear lacquer.

The units are mounted on strips of fibre or bakelite. Pins are made from short pieces of No. 14 bare copper wire, inserted through the ends of the mounting strip and bent to form a closed loop. If the end is clamped in a vise, the wire will press into the mounting strip and make a very rigid job.

The sockets in which the units are inserted are made by facing off the heads of 6-32 R. H. brass machine screws in a lathe and drilling holes into the screws with a No. 48 drill, ½" deep. Mount the drilled machine screws on the panels and make connections underneath the panels to correspond with the inscribed wiring diagram on the face of the panel. Provide two binding posts in each panel for terminals. Mount legs at each corner of the panels with pieces of ½" dowel, 2" long.—*Walter B. Ford.*

A motor fuel called Jeanite has been produced from blackstrap molasses by Dr. J. W. Jean of Louisiana State University.

Junior Machine Gun

[*Continued from page* 97]

work is illustrated in the perspective drawing. Note that the right-hand side plate is removable, and the wedge block permits trying several different hammers in order to obtain the one with the best performance. Front and rear sights add to the efficient appearance of the weapon, although the bullets cannot be expected to travel any great distance.

Note that the hammer is offset just enough to clear the next cartridge in the magazine; thus when one is shot away, the next rolls down by gravity. Paint the tracer bullets red, the others yellow so that they can be easily spotted and retrieved after firing. The magazine is scroll-sawed from 1⅛" material, assembled with thin side pieces, then glued and screwed to the right hand side plate. A tripod and swivel bracket are made as illustrated, and the entire equipment should be painted olive drab.

Toyland Train

[*Continued from page* 96]

drill holes in them, and glue in ⅛" dowel axles. Attach these to the underside of the base with two-pointed tacks loosely, so the axles turn. Cut the large wheels, slip the ¼" dowel axle through the hole drilled in the base and glue it into the wheels. Cut a length of ¼" dowel for a handle, drive a finish nail into the lower end and bend it over to form a hook. Put in two or three screweyes, string the cord through these and hook the nail into a screweye in the cowcatcher. Leave the toy the natural color of the wood except as otherwise indicated and outline the features with black. A pull on the cord at the top of the handle will move the heads.—*Roberta Fairall*

Vacuum-Drive Propeller

[*Continued from page* 61]

this mass, which has properties of water as deep as the column in the standpipe is high. It is good, "solid" water, instead of being "full of holes" and hence an insubstantial basis for the propulsion thrust, as water near the surface frequently is.

Several other advantages are claimed by the inventor. The propeller is always up out of harm's way, even if the boat runs over sandbars, logs or other submerged obstacles. If grounded, the reversed propeller digs the boat free by hydraulic action of the forward-pushed current. The water mass in the well seems to act as a sort of inverted centerboard, increasing stability.

Special railroad excursions were necessary to carry the crowds who wanted to hear the first phonograph at Edison's Menlo Park.

Never mind "who done it"—pitch in and help *get* it down!

THIS IS YOUR UNCLE SAM talking—but I'm going to talk to you like a DUTCH uncle, to keep all of us from going broke.

Ever since the Axis hauled off and hit us when we weren't looking, prices have been nudging upwards. Not rising awfully fast, but RISING.

If this keeps up—we're all going to be in hot water.

The government's done a lot to keep prices down. That's what price ceilings and wage controls are for. Rationing helps, too.

But let me tell you this—we're *never* going to keep prices down unless we ALL help—EVERY LAST ONE OF US.

All right, then. Here are the seven rules we've got to follow as GOSPEL from now until this war is over. Not some of them—ALL of them. Not some of us—ALL OF US, farmers, businessmen, laborers, white collar workers!

Buy only what you need. A patch on your pants is a badge of honor these days.

Keep your OWN prices DOWN. Don't ask higher prices—for your own labor, your own services, or goods you sell. Resist all pressure to force YOUR prices up!

Never pay a penny more than the ceiling price for ANYTHING. Don't buy rationed goods without giving up the right amount of coupons.

Pay your taxes willingly, no matter how stiff they get. This war's got to be paid for and *taxes are the cheapest way to do it.*

Pay off your old debts. Don't make any new ones.

Start a savings account and make regular deposits. Buy and keep up life insurance.

Buy War Bonds and hold on to them. Buy them with dimes and dollars it HURTS like blazes to do without.

Start making these sacrifices now—keep them up for the duration—and this country of ours will be sitting pretty after the war . . . *and so will you.*

Uncle Sam

KEEP PRICES DOWN!

Use it up • Wear it out
Make it do • Or do without

This advertisement, prepared by the War Advertising Council, is contributed by this magazine in co-operation with the Magazine Publishers of America.

Beating Old Man Winter

[*Continued from page* 91]

radiator covers, if you have any. If these are badly designed, closing in the heat beneath them, they may waste as much as thirty per cent of the heat. Well-designed covers that permit a free circulation of air, do cut off some of the radiant heat, but they distribute the convected heat closer to the floor where it makes living more comfortable.

Leaky pipe joints and defective pipes, in all kinds of heating systems, are another cause of heat loss. Inspect the piping of your hot-air system, and the smoke-pipe to the chimney. Also examine the boiler for air leaks. Note if base of boiler has been properly cemented, and if space between sections and base has been well sealed with boiler putty. Be sure that doors are not warped, and fit tight. The fire cannot be properly controlled if there are any air leaks in the furnace or its fittings.

If there is oil in your boiler water it is costing you extra money because of the added heat required to break down the greater surface tension produced. You can find out by drawing off a little of the boiler water from the cock under the gauge glass. Shake the sample. If, after shaking, bubbles in the water rise quickly and disappear, there is no oil in the water, no matter how dirty it appears. If, however, the bubbles remain suspended there is oil which must be removed. This may be accomplished either by having a plumber "blow the boiler," or by adding a prepared compound to the water which combines with the oil and allows it to be drained out.

If your heating plant is old-fashioned perhaps a gadget or two may pay for itself in a short time. Most older systems work on the simple gravity principle. Hot air, steam, water, rise because they are lighter. The idea is good, but the working out of it often results in slow heating and high fuel bills. Water and hot air, in particular, move faster and more efficiently, if given a push. In a warm air system, an automatic fan in the return duct will do the trick; in a hot water system a compact automatic electric circulating pump speeds hot water through the house with a considerable saving in fuel.

In the hand-fired coal furnace, careful checking and attention to details may pile up fuel savings that may run up to 40 per cent of a care less homeowner's bill. Begin checking with the chimney, as consistently poor combustion is due to improper draft. Often a chimney is too large or too small, or its efficiency is cut by a chimney cap, or a neighboring gable or high building that blocks it. Perhaps its draft is weakened by leaks in the brickwork or by protruding tile. The inside may be inspected by holding a small mirror in the smokepipe opening. If the draft is found to be too strong it may be cut down by partly closing the smokepipe damper. At the same time you may economize by using smaller coal. If the draft is too weak, and the fault cannot be corrected, then for good combustion you must keep the coal bed thinner, by firing more often, and you must use larger coal to permit air to get through it.

For greatest comfort and economy the fire should burn as uniformly as possible. As a rule the firebox should be kept full, and it is better to put on coal enough to last for half a day than to feed it in dribbles. Shake grates no more than necessary to permit flow of air through fire. When the weather is mild the fire should slumber on a bed of ashes from two to six inches deep. As it gets colder shake down the ashes for greater draft, and more space for coal above.

Clean out ashes every day, as ashes banked up under grate shuts off air and tends to warp the grate bars.

8,000 Pictures Per Second!

[*Continued from page* 88]

a rotating prism which is synchronized with the film and transmits successive and properly spaced images to the film. The image from the lens is refracted upward to meet the incoming frame, and as the frame moves downward, the image follows, thereby permitting a continued exposure. The 8 has an eight-sided prism; the 16 has a four-sided one. Both models take rolls of 50-ft. or 100-ft. film. At top speed the film travels through the camera at 70 m.p.h., the exposure at this speed being about 1/30,000 of a second for the 8 and 1/12,000 of a second for the 16. The 8-mm. film is 16-mm. size run through twice as in the "Double 8" models. A ground glass viewing screen mounted on the cover "looks" through the regular camera lens by means of an internal reflecting arrangement. Of course, very strong lighting is needed for operation of the *Fastax*.

Multiple Passage Pipe

[*Continued from page* 123]

in rotation to allow those not in use time to sweeten up.) Next, ream out the bit to take the smallest tube, making a press fit, and anchor the intermediate tube in a grooved wooden or metal cap. To simplify the job, a cork may be substituted for the cap, and grooves cut in it by pressing the cork over the ends of the tubing.

Saliva which collects in the bottom of the pipe can be shaken out readily by pulling the cap or cork as illustrated, and, whenever you desire to remove the smoke tar from the pasageways, you need only unscrew the bowl and flush out the pipe with water.

All mammals can swim, many expertly, but not all like water.

Tanks can be fought with smoke, the Army Chemical Warfare Service has reported.

Send your soldier "Good Pictures"... of the old familiar scenes . . . the home place, the best girl, the old fishin' hole, sister Mary's new baby, the puppy now a dog, the cabin up the river . . . all the happy scenes of home sweet home. That's what counts a thousand miles from nowhere.

Make the most of your present camera! Take good care of it, and conserve vital film by making each picture a good picture. After Victory Argus will make new cameras . . . employing the new techniques and extensive experience acquired in War Production.

FINE AMERICAN CAMERAS
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PRECISION OPTICAL INSTRUMENTS
•
AVIATION RADIO EQUIPMENT
•
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argus

INTERNATIONAL INDUSTRIES, INC

ANN ARBOR MICHIGAN

"Good Pictures"

Make the best use of your present equipment—learn more about lenses—films, filters and composition. Send 25c today for this 56-page booklet.

We Fight The Wolf Packs

[*Continued from page 70*]

Lafferty taxied over the rough sea, but the Widgeon would not take off. She had shipped so much water during the rescue that she was weighted down and could not gain sufficient flying speed. Despite his suffering, Klemm continued the artificial respiration while Lafferty baled water. Once again the pilot climbed behind the controls and gave her the gun. This time the Widgeon took off and flew to the base like a homing pigeon. Only thirty minutes elapsed between the time Lafferty received his radioed instructions and the moment the victim was placed in a waiting ambulance on shore.

Not all of the Widgeons do work that has the glamour of a heroic rescue at sea or the headline making stuff of battle against a U-boat. Yet some of these other tasks are of vital importance to the war effort. Take, for instance, the production of steel. The iron ore to feed the hungry blast furnaces must travel by steamer over the Great Lakes. This waterway freezes solid each winter. In temperatures far below zero the Widgeon takes to the air, studies and photographs the ice formations. It is on the basis of its findings that plans are made for the opening of the lakes to navigation again. It seeks out the first crack in the ice in the closing days of winter and, when the loaded lake steamers set out for the mills, shepherds them through the ice fields. The Widgeon's work has added weeks to the water traffic on the Great Lakes and as a result many thousands of tons of additional ore.

Even in wartime the Coast Guard's Widgeon has not forgotten its obligations to the civilian population. Recently, when the muddy waters of the Ohio River surged over its banks, sweeping through farmlands and inundating cities, it was the J4F that flew in like an angel of mercy. She winged down the flooded valleys and by means of radio, directed surface craft to the places where bewildered families were perched on housetops. Risking the dangers of submerged objects, the Widgeon would put down in remote spots to snatch victims from the hungry maw of the flood waters.

The fact that the German subs are now armed with anti-aircraft artillery made it imperative for the strategists in both the Navy and Coast Guard—the Coast Guard is a branch of the Navy in wartime—to evolve a new method of fighting a revived menace. Whatever the new plans are, and they cannot now be revealed, you can rest assured that the Widgeon will be in the forefront of the fight.

And you can be further assured that the Coast Guard's aerial jeep will handle this job as successfully as she does her dozens of others.

One auto contains enough tin to coat 1,000 cans of food for soldiers.

Rubies are next to diamonds in hardness among minerals.

30-Minute Model Plane

[*Continued from page 112*]

the exposed ends are covered with aluminum. The fin is secured with wire pressed into the upright members and a stiff wire across the fuselage reinforces the stabilizer, which is built upon a streamlined block at the end of the fuselage, Fig. 8. Small trimming tabs of aluminum are attached firmly to both fin and stabilizer.

Assembly of wing and tip is illustrated in Fig. 9, which shows the thorough bracing of the structure and joints of the spars. Wide wire staples are pressed into leading and trailing members. In Fig. 10 is given the half-plan, the wing drawn in flat position in order to present dimensions correctly. Balsa is used exclusively in the wing and stabilizer except where otherwise indicated. Wing and stabilizer sections are given in Fig. 12. These are cut from $\frac{1}{16}$" soft balsa.

The double dihedral angles are shown in Fig. 13 and the sturdy joints of the spars in Fig. 11. For the main spars a yoke of $\frac{1}{8}$" plywood is bound to them with thread as shown and a $\frac{1}{8}$" balsa bulkhead cemented to it. A similar bulkhead is also cemented to the secondary spar. Over the tops of these bulkheads and the two inner ribs is a panel of 1/32" plywood extending from leading to trailing edge. The assembly is built upon a base block of $\frac{1}{2}$" by 2" balsa.

Follow usual procedure in covering the framework, wings, etc., and for spotting easily in the air, paint fuselage, wings and stabilizer olive drab. A bright yellow fin will make your plane conspicuous on the ground. The wing is held on with rubber bands in the usual manner.

Ideas For Service Men

[*Continued from page 119*]

and building of the little writing table illustrated. The table is small enough to be put out of the way when not in use, yet large enough to write comfortably on. It sits firmly on the bunk rail, held in place by the slots cut in the bottom of the legs. Can be made from any scraps of wood that happen to be lying around. Clever, what?

SERVICE MEN, ATTENTION!

This is your department, and if you like it enough to want to make it better, you can. It's all up to you! Send in your ideas—anything you think may help your buddies in the Army, Navy or Marines. You'll be helping yourself too, because MECHANIX ILLUSTRATED pays from $2.50 up for material used. Address "Ideas for Service Men," MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, N. Y.

Woodpeckers seldom injure trees, but destroy injurious tree insects.

Sperm oil, invaluable as a "breaking-in" oil for airplane motors, was formerly used to tan leathers.

"THIS WISDOM MUST DIE!"

Truths That Have Been Denied Struggling Humanity

FOR every word that has left the lips of bishops or statesmen to enlighten man, a thousand have been withheld. For every book publicly exposed to the inquiring mind, one hundred more have been suppressed—*damned to oblivion*. Each year of progress has been wilfully delayed centuries. Wisdom has had to filter through biased, secret sessions or ecclesiastical council meetings, where high dignitaries of state and church alone proclaimed what man should know.

Are you prepared to demand the hidden facts of life? Will you continue to believe that you are not capable of weighing the worth of knowledge that concerns your personal freedom and happiness? Realize that much that can make your life more *understandable* and *livable* has been left unexplained or intentionally destroyed. At first by word of mouth only, and *now* by private discourses, are *revealed* those truths which secret brotherhoods preserved in ancient temples and hidden sanctuaries, from those who sought to selfishly deprive humanity of them.

THIS *free* BOOK OF EXPLANATION

Let the Rosicrucians, one of these ancient brotherhoods of learning, tell you about these amazing truths, and explain how you, too, like thousands of others, may now use them to enjoy the fullness of life. The Rosicrucians, (not a religious organization) invite you to use the coupon opposite and receive the FREE copy of the fascinating, Sealed Book, with its startling tale of *self help*.

The ROSICRUCIANS (AMQRC)
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Scribe J. S. M.
THE ROSICRUCIANS (AMORC)
Rosicrucian Park, San Jose, California, U.S.A.

Please send me your FREE Sealed Book. I am sincerely interested in learning how I may receive these long-concealed facts of life.

Name.....

Address.....

Wings, Bombs And Bullets

[*Continued from page* 48]

installed in our planes now coming off the production lines. The new 37-mm. penetrates tank armor. The 37-mm. cannon is by no means the end of the trail. Much additional work has been done on heavy equipment, and planes with surprising developments in heavy aircraft cannon will soon appear on the combat fronts.

The outstanding small-arms development for uses against airplanes was the incendiary caliber .50 cartridge. The most vulnerable part of a modern airplane is the gas tank. With the advent of the self-sealing gas tank, it was found that tracer ammunition was ineffective for setting aircraft on fire. So caliber .50 incendiary projectiles were introduced. These, fired in conjunction with armor-piercing bullets, make the caliber .50 the best gun for airplanes to date.

In the last war, the ordinary ring-and-bead sight was used almost entirely. Today, this sight is used only on hand-held guns, for our planes mount a reflector sight which projects a parallel-ray beam of light, causing a ring on a bead to appear as if it were on the target. This ring and bead can be seen from many points in the cockpit, enabling the pilot to control his airplane in order to place the target in the proper position. The gun camera aids greatly in making our pilots expert marksmen. Shooting pictures in place of bullets in simulated dogfights, it produces an undeniable record. These cameras are often used in combat in conjunction with real bullets to check marksmanship and results.

There are three categories of aerial bombs: demolition, fragmentation, and chemical. The demolition bomb was designed to blast a wall apart, to burst a hole in a ship, to excavate the foundation of a structure, or to crumple a dam. A demolition bomb is a packing case carrying a charge of high explosive to the point where it can be used to the greatest advantage. It is housed in a bomb body or case which is made as light as possible yet with sufficient structural strength to give the penetration necessary and to avoid breaking open on striking its objective.

The chief factor in obtaining the maximum destruction from an explosive is confinement. The destruction wrought by a well-confined explosive may be four to five times as great as the same amount unconfined. The bomb is made to penetrate a building, the ground, a ship, or the water beside a ship. This requires demolition bombs of varying hardness and case thickness in order to carry the maximum amount of explosive to the center of the target. The several types are: general-purpose, semi-armor-piercing, armor-piercing, light-case, and depth bombs.

Up until the late 1920's, demolition-bomb construction was based on a design of cast sections welded to plate steel. At this time it was realized that targets for bombs were increasing in toughness and resistance. The forged bomb case was introduced which had a tensile strength of 90,000 pounds per square inch. This required heavy forging machinery which would not be available for war production. To meet this difficulty, a combined forged and welded bomb was fabricated. The investigation led to our present general-purpose bomb which has a minimum case strength of 105,000 pounds per square inch whether forged or welded. The general-purpose bomb is made of such strength that it can be dropped without rupturing against a concrete slab 4 feet thick from an altitude of 8,000 feet. Using a delay-action fuze, bombs of this type can crash through to the basement of most buildings, bury themselves several feet in the ground near a bridge, or penetrate the deck of all seacraft except the thickly armored decks of heavy cruisers and battleships.

The general-purpose bomb is made in five sizes, which will produce damage as follows:

100-pound.—Demolish an average 2-story building, wreck a locomotive, gun installation, or other machinery from 10 feet, and damage an airplane by fragments from 75 feet.

250-pound.—Destroy the walls and floors of all types of buildings except skyscrapers, sink or severely damage all seacraft except battleships and cruisers as far as 20 feet away, cut railway tracks and tear them up for 30 feet.

500-pound.—Cause 75 feet of concrete dock to collapse from 25 feet away, cause collapse of steel railway bridges and subway passages, sink or seriously damage light cruisers as far as 25 feet away, penetrate and completely demolish most tanks. This is the bomb that sank about 39 Japanese transports and cargo ships in the Macassar Straits.

1,000-pound.—Displace piers and spans of heaviest bridges.

2,000-pound.—Crack or burst a large hole in dams, sink or seriously damage battle cruisers and battleships of the most modern construction on direct hits or as far as 35 feet away when exploded in the water.

The general-purpose bomb can be used effectively against nearly every objective by using the proper tactics. It can be used by the Army Air Forces, the U. S. Navy, and the Royal Air Force. It can even split the sides of a submarine on detonating at the proper depth. This is accomplished by using a fuze with the proper delay action or by incorporating the Navy hydrostatic tail fuze.

To reach the vital organs of targets which the general-purpose bomb will not penetrate, 500-pound and 1,000-pound semi-armor-piercing bombs were developed. The heaviest tank can be punctured by the 500-pound semi-armor-piercing bomb while the 1,000-pound bomb of this

type will pierce the sides or decks of all seacraft, except battle cruisers and battleships.

To insure functioning, our general-purpose bombs have both a nose and tail fuze. They are made with different delays in functioning to meet the requirements of the targets. To insure the safety of the plane dropping the bombs, the fuzes are of such construction as to make it almost impossible for the bomb to detonate accidentally.

The real power of fragmentation is being realized every day in the present conflict. The fragmentation bomb made its appearance during the last war as a 20-pound, cast steel or forged shell. Its high-explosive core would break the forged shell into about 250 to 300 pieces and the cast steel shell into fewer pieces plus a considerable amount of ineffective powder. The double requirement that exists for demolition bombs—that they should produce their effect primarily by blast and secondly by fragments—is reduced to a single purpose with fragmentation bombs—they produce destruction as a result of fragmentation of the bomb case. Our fragmentation bombs of today consist of steel cylinders with end caps and contain an explosive core of TNT. A spiral coil made from rectangular iron rod covers the outside of the cylinders. They break into 1,000 to 1,500 pieces of about 0.3-ounce average weight, having velocities up to 4,000 feet a second. At 200 feet, the fragments will go through an airplane wing or gas tank, tires and control wires, or perforate radiators and intercoolers.

In order to give low-flying bombers time to escape and also to allow the fragmentation bomb to strike squarely on its nose, the condition which produces the maximum effect, it was necessary to attach a parachute to the bomb. Perhaps the greatest demonstration of parachute bombing ever seen was in the Battle of New Guinea. As the Japanese were crossing the Owen Stanley Range attempting to take Port Moresby, every type of combat possible was waged against them, but the one thing they could not contend with was the fragmentation bomb. Dropped against front-line infantry and against the lines of communications, the bombs kept the troops and pack trains off the trails, forcing them to be without food and water. There are many examples of airdromes, supply trains, and encampments cut to pieces by these bombs.

A third type of bomb, some of which are in use and others held in readiness by the A.A.F., is the chemical bomb. The chemical agents, which are procured by the Chemical Warfare Service, may be any of the following types: (1) Harassing agents which hinder the operation of troops by forcing them to wear their gas masks, or to remove them in order to sneeze or vomit, thus rendering them vulnerable to other gases; (2) Casualty agents which do bodily harm, such as chlorine, mustard gas, or phosgene; (3) Screening smokes—agents producing dense, obscuring

Dear Bill:

I'm the guy up front

This is the outfit for an old cycle fan! I thought I knew motorcycles, but the Army's teaching me plenty!

I'm riding an Indian -- as usual. What a machine! Our operations course is plenty tough but Indian's got the guts to take it -- and for easy handling and safety, give me Indian any day!

Incidentally, Indian's got some swell new improvements. It'll be a really great machine to ride when this war's over. Regards to the gang!

INDIAN MOTOCYCLE COMPANY, SPRINGFIELD, MASS.

Indian

BUY WAR BONDS NOW

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smoke; (4) Incendiary agents which produce much heat and set fire to combustible material.

The chemical bomb has a very light steel case that may be filled with also most any chemical agent and weighs 100 pounds. Filled with mustard gas, it becomes a casualty bomb; filled with white phosphorus, it becomes an incendiary and smoke bomb. A plane may carry from 1,500 to 2,000 small incendiary bombs. These weigh about 4 pounds and burn at temperatures of 3,300 degrees to 4,500 degrees Fahrenheit. Packed in clusters, they open as they fall.

The perfection of our armament in combat can only be obtained by the full co-operation between the Ordnance designers in their work on weapons and ammunition and the Air Forces designers in their work on airplanes to carry these weapons and ammunition. The Air Forces has maintained a testing unit at Aberdeen Proving Ground for a number of years. This unit supplements the regular Ordnance installations in the development and test of all types of armament equipment. The ballistics research laboratory at Aberdeen Proving Ground, through the use of this unit, is able to furnish necessary technical information and data to be used in the design of new bomb and gun sights as well as in the compilation of the firing and bombing tables so necessary for accuracy.

At Wright Field, where the Air Forces' development work is done, there are Ordnance representatives who provide the advice and assistance necessary in incorporating the best of armament in the best of airplanes. The Army Air Forces has a proving ground at Elgin Field, Fla. There all types of equipment used by the Air Forces are thoroughly service tested, and the most effective technique for using the equipment in combat is determined. The Ordnance member of the proving-ground committee and his technical helpers furnish the necessary assistance in determining if the equipment is ready for combat.

The evolution of the Ordnance troops needed by the Air Forces has paralleled the growth of the armament equipment handled by them for the Air Forces. Beginning with simple supply and technical advice during the first World War, it progressed to one Ordnance platoon at each Air Force station, and, finally, in 1940 the troops were increased to one company per group. Their work became of such volume that in February, 1941, reorganization to one airbase company for each air base and one company (pursuit or bombardment) for each group of pursuit or bombardment was effected. Upon the dissolution of the G.H.Q. Air Force and the establishment of the Air Forces as an entirely separate and distinct branch of service, each combat group and each service center was assigned one or more companies, and each air force depot was assigned one company. Later, the companies with tactical units were disbanded and the work was given to Ordnance sections organically assigned to the tactical squadrons. The work of these troops must be flexible, reliable, and capable of meeting sudden, terrific demands. A good illustration is the job done by forty-eight enlisted men in the Battle of Buna. During those 3 days, these 48 men serviced bombers with 200 tons of bombs without adequate handling equipment. Frequently it has been necessary for units of maintenance companies to execute repairs on planes themselves since they are one of the few units which have machine tools available.

Another very outstanding example of resourcefulness that is so often the difference between victory and defeat happened in the Battle of the Bismarck Sea. In the absence of proper fuzes for minimum-altitude bombing, the Ordnance personnel in New Guinea modified enough of the available fuzes to equip all the bombs dropped by these tactics during the night before this unparalleled victory.

An invaluable tactical development that proved to be so deadly in the Battle of the Bismarck Sea was bombing from the lowest altitude at which the attacking plane can be flown and still clear obstructions. The object of the attack known as minimum-altitude bombing is to fly at maximum speed and release the bomb so that it hits the side of the target. The general principles were conceived by the Ordnance member of the proving ground committee, and the development to combat stages was performed by the proving-ground command. New-type fuzes were required, giving longer than normal delay and allowing the plane to reach a safe distance before exploding the bomb. A sight that could be used by the pilot was necessary. This was accomplished by modifying the present gun sight. Such ingenuity is responsible for the fact that not one of the twenty-two ships in the Japanese convoy in the Bismarck Sea was known to have escaped destruction.

The Ordnance Department plays a very important part in making these planes military, and judging from the past it is certain that the Ordnance Department and the many private concerns who work so closely with it will have the bombs, guns, cannon, and other weapons ready when the airplanes of tomorrow come off the production lines.

Haleakala crater's "bottomless pit" proved only 60 feet deep when explorers recently visited it in Hawaii National Park.

Edison was the first person to say "Hello" on the telephone—before that, people used to say "Are you ready to talk?"

Instruction of New York's air raid-wardens by television—something entirely new in education—is so successful it is to be continued indefinitely.

Your Invention Clinic

[Continued from page 12]

only in the organization where you are employed but in many other industrial plants throughout the country.

We would recommend that you have a search made immediately. We would then suggest that you apply for a patent. Simultaneous with the application and if your patent attorney agrees, we would recommend that you call this design to the attention of officials in your organization to see if they cannot introduce it immediately and put it to use. Unquestionably, it will save manpower hours. In fact, your organization might be instrumental in manufacturing and distributing such tools throughout the country. And the quicker that is done the better.

Vane Type Combustion Engine

William Weinstein, New York, N. Y., asks us to describe the valve mechanism of the vane-type gasoline engine, the number of vanes and perhaps a copy of the illustration submitted by another correspondent to this department. He says he is interested in developing such an engine.

ANSWER: *As mentioned previously many vane-type gasoline engines have been designed and patented. You can find illustrations of these in the Official U. S. Patent Gazette.*

A simplified form is presented by the ordinary windshield wiper which contains a valve and a vane operating back and forth.

Our files remain closed. We do not furnish designs submitted by others to this department to anyone else. However, we are happy to send you the name and address of our previous correspondent and he may be willing to furnish you with a duplicate of his design.

Tool Holder and Soldering Iron Attachments

Clyde E. Villines, Kansas City, Mo., submits a design for a tool holder useful for wiring and assembly of electric machinery and also furnishes a design for an attachment to a soldering iron which holds solder and another helpful tool.

ANSWER: *We do not believe that either of these ideas possesses patentable features. The tool holder is very similar, except in minor respects, with the holders every lineman uses in his pole work. The advantage of your device over his is that it is instantly attachable and detachable. The disadvantage of your system is that it can be displaced easily. Nevertheless, it appears to be a fine gadget and if submitted to the officials of your company as an idea for increasing speed of production, it may be that you will be paid a small sum of money for contributing the thought.*

The soldering iron combination with roll solder is a very old idea. It was described in magazines fourteen years ago. The second attachable tool mentioned by you may be helpful but we do not consider it essential.

INVENTORS Now

IS THE TIME TO PATENT & SELL YOUR INVENTION

Now, more than ever before, is the right time to patent your invention. Why? Because manufacturers presently engaged in war production are looking ahead to the future by buying up patent rights now, so they will have new and attractive items to make and sell for civilian consumption as soon as the war is over. This is what happened during and after the last war. Hence, the smart thing for you to do is to look ahead to the future too. Protect your invention by applying for a patent now, so you will be in position to cash in on an outright sale, or on the royalties your invention will bring.

"PATENT GUIDE" SHOWS WHAT TO DO

Our Free "Patent Guide" contains complete information about patent procedure and how to sell inventions. It tells you how to find out whether your invention is probably patentable; what steps to take in order to obtain patent protection for your invention; how to arrange for the profitable sale of your invention; and how to secure financial backing if necessary. Our "Patent Guide" also gives many illustrations of successful inventions; how many simple improvements on already existing inventions proved to be large commercial successes; contains countless other items of vital interest to all inventors including the illustration of over 150 basic mechanical movements. With our "Patent Guide" you also will receive free a "Record of Invention" form with instructions for making disclosure and establishing date of your invention.

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Streamlined Machine

[*Continued from page* 51]

should not be bogged down in the minor details of getting testtubes and pharmaceutical supplies together, preparing germ cultures, or boning up on all the pertinent literature. To insure that no latent talents go to waste, there is a definite hierarchy at the center, a sort of step-ladder of skills which each new recruit climbs until he reaches the level on which all his capacities are called into play. The aspiring young scientist, having received a competent college education in the basic sciences, with advanced training in special fields, is accepted as an Assistant. After a year, if aptitude has been shown, he may become an Associate. It takes three years, during which he must demonstrate research ability and carry through a project on his own, before he is eligible for a Master of Science degree. More responsible research work is required before the Associate can rise to the status of a Member. Finally, if outstanding ability is shown over a period of years, the Member may be elected to a Fellowship, which gives him free access to every facility in the Institutum's far-flung laboratories. As one staff worker puts it, "It's a long haul to a Fellowship out here, but, brother, once you've made it you're a *scientist*."

Another cardinal principle at the Institutum is that there must be a constant flow of ideas and information between scientists in fields even remotely related. Assistants to top research men are regularly assigned to make surveys of the work done in particular fields, so that each research director, when he embarks on a new project, will have at his fingertips every jot and tag-end of information relative to the job. Assistants also ease the burden on their superiors by setting up the small substantiating experiments that can safely be entrusted to apprentice scientists. The local staff of each laboratory affiliated with the Institutum meets regularly, sometimes as often as once a week, to mull over what has been accomplished and map out future work. A monthly *Chronicle* issued at headquarters circulates through the whole organization. Conclusive results from each project are made available to the whole scientific world through the *Studies* issued constantly by the Institutum. Once a year there is a grand round-up, with representatives of all the branch units gathering in Cincinnati to thrash out the results of the year's work.

Ehrlich and Pasteur, working unaided in blind alleys, unaware of what other workers were accomplishing around the world, often felt helpless and lost—the bugbear of discouragement flourishes in an atmosphere of isolation. In proportion to its size, the Institutum has issued more papers on original research projects than any

[*Continued on page* 148]

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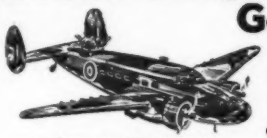

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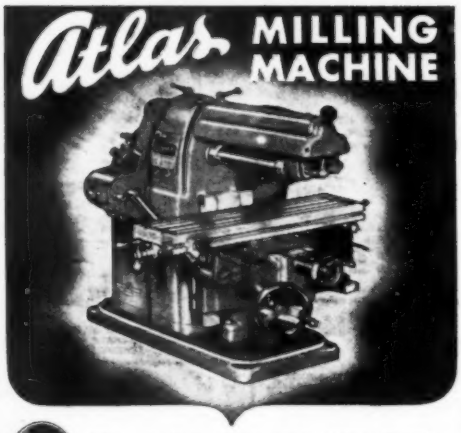

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Streamlined Machine

[*Continued from page* 146]

other research center in America. The organization's current catalogue lists 126 publications, covering a wide range of fields including optics, biophysics, spectroscopy, synthetic organic chemistry, biochemistry, vitamins, plant physiology, genetics, bacteriology, wound healing, botany, cancer, and philosophy in relation to science.

Early in the war, it was realized that the nation's fund of researchers had to be banded together in an organization that would outstrip Germany's streamlined science machine. Accordingly, Donald M. Nelson called up the "heavenly twins" of the Institutum Divi Thomae, Dr. Sperti and Monsignor Cletus A. Miller, to help set up the office of Production Research and Development. Later, Senator Harley M. Kilgore of West Virginia invited the Institutum's experts to testify before a hearing on the Office of Technological Mobilization which he was sponsoring. Senator Kilgore referred to the Institutum as a "pilot plant" of scientific research, and expressed the hope that the country would "go into production" on the Institutum's idea of a united front in science. In the Senator's words, and in the events which were their background, may well be a harbinger of things to come on the American science front. In the post-war world the co-operative idea stands a good chance of taking hold in many of the country's university, hospital, and industrial laboratories. There may be born, thanks largely to the efforts of Dr. Sperti and his associates, a closely knit fraternity of American scientists, trading data and ideas, putting their heads together to plan joint projects of breath-taking scope. If that happens, there will no more American Ehrlichs left to flounder in dismal garrets.

Seals take short "naps" by sinking to the bottom in shallow water and resting motionless.

"You should see some of the expressions I get with it."

Lazy Inventors

[*Continued from page 57*]

the Zulu in charge of pythons at the South African Snake Garden of Port Elizabeth, dozens of times proved to my companions and myself the effectiveness of this method, by letting several pythons crawl all over him, as many as his stout body could materially support. One of them alone could have crushed him to death in a fraction of a second. But none of them even attempted it. At the right moment Charlie's finger would go to work, and the snakes were transformed into inoffensive pets.

* * *

Jumping to another part of Africa, and speaking from a purely mechanical point of view, to wear one's China in one's upper lip is quite a bit of an achievement, even if the plate carried that way is made of wood. It is a feat from the surgical standpoint, too. Because it means a small hole pierced in childhood and carefully nursed throughout the years to keep it ever increasing in size, by the insertion of ever larger disks of wood. Until, upon reaching womanhood, the Ubangi belle can without the slightest embarrassment sport a quoit no less than thirty inches in circumference.

It is a well-known custom, and one which might appear purely stupid, cruel and barbaric. But behind it, there is a very sound reason, of which few people are aware. Mohammed Ali Ben Salum explained it to me himself. And what this old coot says, has authority. For he was born in the Congo, some eighty years ago. For a good half of his life he has exercised his family's profession of slave trader. Why, in full confidence he told me that he made his last transactions as late as in 1908. Then, the white man's law shut down his business for good.

But, he still complains, he could have lived these last 35 years in much greater prosperity, had it not been for the trick played on him by the Ubangi. Women of that region were then as strong and robust as they still are nowadays. And there was great demand for them in the slave market. So every year Mohammed, at the head of some dozens of rascals of his race, would make a surprise raid. They would shoot right and left with their old-fashioned muskets, scare away the men, capture as many women as they could, and depart at top speed.

Finally the Ubangi got fed up, and a local Edison launched the idea of the wooden plate in the lip. Mohammed's clients began to protest. They didn't want to buy for export such deformed, horrible-looking females. A few years later, Mohammed had so many leftovers (and such an overhead to feed them) that he made a last and final expedition into the Ubangi. Not to take away slaves, this time; but to return the unwanted women who crowded his "shelves." A sheer loss for him; but a life-saver for the Ubangi,

[*Continued on page 150*]

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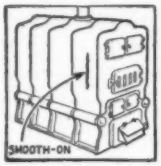

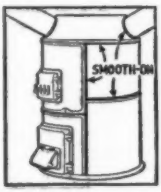

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Lazy Inventors

[*Continued from page* 149]

who by this clever device got rid of the slave traders many years before the white man closed forever their nefarious commerce.

The custom, however, was not destroyed, then. For the Ubangi women are not only strong and robust. They are also overpoweringly talkative and shrill of voice. And their men had meanwhile discovered that the wooden plate had another miraculous property—that of keeping their better halves silent most of the time, and of conveniently muffling their voice on all other occasions. And so it came about that men stoutly continued to encourage and perpetuate the custom by refusing to marry any women whose "standard equipment" did not include that so practical muffler. With the result that, up to date, their country is the one with the lowest percentage of divorces.

This is only a facet of the same common sense, shrewd balancing of causes and effects, and resourceful imagination which, for instance, induced the African natives to observe that in a fight there was no handier way for a warrior to win than to grab and hold an enemy by his long whiskers, while conking his head with a club or a cleaver held in the other hand. So it was that, though knowing no instrument like a razor, they were among the first human beings to dispose of their beards. An operation which they periodically executed with the help of a searing stick or by covering their chin with resin and then stoically pulling away the whole mess. And to which they are generally faithful to this day, though having somewhat improved the method by

"If you can't make up your mind, let's ask your husband which one he likes best."

Lazy Inventors

using the head of an awkward, five-foot spear.

The Wambas of the Ituri are another good example.

They are crazy for loud, piercing music such as only horns can give. But in their territories the tzetze fly, spreader of sleeping sickness, makes impossible the existence of cattle or any other hollow-horned ruminant. Elephants, however, are plentiful. And the lower portion of an elephant's tusk has a cavity for the passage of the tooth nerve. The Wambas enlarge this cavity, embellish the outside with some carving—and give the horns to their women. It is again two pigeons with one stone. They get all the music they want. And—blowing into such horns being an extremely exhausing job—they get no back talk from their lung-fagged wives when they all go home.

Banana trees are so abundant and prolific, in his country, that the Wamba has found a use for their leaves other than as skirts for his women. Their middle stalk, six or seven feet in length, is a conglomeration of intercommunicating cells enclosed in a thick, pulpy green tube soaked with juice.

As a liquid cooled pipe, it's a natural. Into the larger end is fitted a clay cup containing the tobacco. It takes a couple of wives to hold the pipe. The smoker must sit quietly and own powerful lungs. But the effort is worth it, the solution ideal. Fully to appreciate it, one has to realize what a kind of dynamite the Wamba's wild tobacco is, if smoked in our kind of pipe. I tried a puff in mine a few years ago. I still cough and choke when I think of it.

Lazy inventors, these African natives, you say? Well—yes; but how efficient!

Your Post-War Airline Job

[*Continued from page* 64]

cludes the Reservations Department as well, has no counterpart in the Army Air Forces, for the Army carries no passengers. The only people aboard their planes are the crews. So the Traffic Departments of the various airlines are wondering where they are going to obtain their rough material for the commercial airline expansion that is due after the war is won. This may be a tip to many Air Force men.

As to how many men the airlines will hire after the war, their executives envision their total personnel doubling two years after the war, and doubling again in two more years. This means in domestic operation alone.

In the meantime, if you want a job with the airlines after the war, you better start training yourself to be a precision pilot, a mechanic specialist, or learn all that you can about traffic, where you can and how you can, and do it now.

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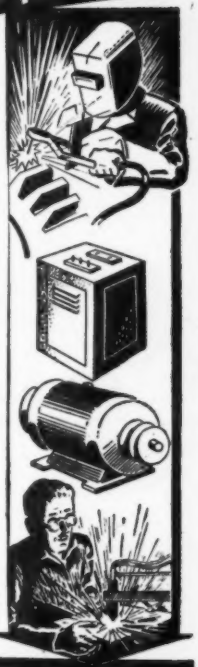

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The February MECHANIX ILLUSTRATED is scheduled to appear

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Editor's Workbench Chips

[*Continued from page* 14]

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Editor's Workbench Chips

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Adventurer

WE ARE happy to introduce a new writer to MI readers with this issue. He is undoubtedly well known to most of you already. He is Commander Attilio Gatti, the noted explorer, author and lecturer. Commander Gatti and Mrs. Gatti have made ten major expeditions into Africa and know that continent better, perhaps, than any other living persons. They have unveiled some of Africa's ancient secrets, discovered new races of strange creatures, been the first to capture specimens of others and have observed and hunted for scientific purposes all of the most interesting animals. Commander Gatti and Mrs. Gatti have had a total of sixty-eight books published, the

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will be happier for all
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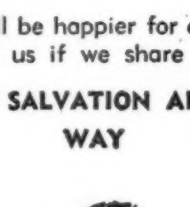

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only 10¢

Editor's Workbench Chips

latest of which is Here is Africa (Charles Scribner's Sons, New York). You will find Here is Africa intriguing and thrilling reading. Meantime, turn to page 54 of this issue and read Commander Gatti's entertaining article, Lazy Inventors.

Security

MANY MI readers work in war plants producing secret weapons. Many MI readers, too, have friends and relatives who will be coming home from the war fronts for the holidays, bringing with them much information which the enemy would like to hear. We'd like to stress the following seven points at this time:

1. Don't talk about anything you have *not* seen in print or heard on the radio, *even* if it seems to be something about which everybody knows. You never can tell when you might be supplying just a bit of lacking information for the enemy's use.

2. Avoid telling even your good friends what Johnny says about where he is bound. Knowing his unit, the enemy might be able to guess the rest.

3. Don't discuss troop movements, whether or not they include a member of your family.

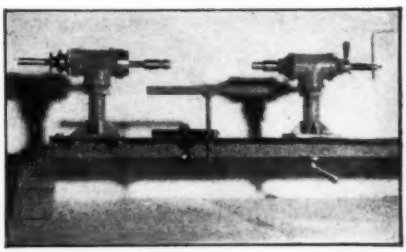
4. If somebody *else* talks, play safe. Don't pass on the information.

5. Don't inadvertently give away war secrets by describing the material you or a member of your family are helping to make in a war production plant.

6. Avoid causing "spy hysteria" by inferring that there are enemy agents everywhere. This is not true, and the assumption that it could cause unnecessary spy hunts or interfere with efforts to capture known spies.

7. Remember that the enemy is depending on

SCRAP PILE LATHE



From an M. I. pattern and an Ontario scrap pile came most of this woodworking lathe. The spindles and centres were turned from two old auto axles. All pipe fittings and the flange plates were scrap. The ingenuity and skill of Mr. M. W. Pringle bring a $3.00 Workbench award and a Certificate of Merit to his home in Gateway, Ontario, Canada.

Editor's Workbench Chips

relatives and friends of men in the armed forces, on war production workers and on innocent bystanders to pass on from person to person the various secrets he wants. Forestall this by silence on any subject about which you have *any* doubt.

Movie-Film Raincoats

THOUSANDS of miles of movie film will soon be worn by Americans in the guise of raincoats and other pyroxylin-coated fabrics, because of a WPB restriction on the use of vinyl resin and pyroxylin for civilian products, reports Wells Martin, head commercial specialist in the Protective Coating Section of the WPB Chemical Branch.

Rubber in civilian fabrics was replaced by vinyl resin synthetics. When this became a critical war material, production again shifted, this time to pyroxylin-coated fabrics, a nitro-cellulose product. But as America goes into action on an increasingly wide front, more nitro-cellulose is needed to make explosives and civilian use of prime nitro-cellulose has been cut by half.

All movie film scrap is now available, however, to fill the gap. Old movies, cuttings, retakes—all are being reclaimed, for chemically it is the same nitro-cellulose, a compound of cotton and nitric acid.

Under present conditions, WPB officials here expect that film scrap will be sufficient to tide us over.

Later it will be necessary for the ingenuity of laboratory workers to produce other substitutes. Practically every laboratory in this field is now working on the problem, it is reported. An oil combined with some resin will probably be next in the parade of products for waterproof garments, coated fabric, paper, cardboard and similar uses.

To save gas, Canada is using sailboats to transport lumber, and outfitting motor boats with new sails.

Canadians are experimenting with a new fertilizer made from the slag of steel furnaces.

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(pages 26-32)

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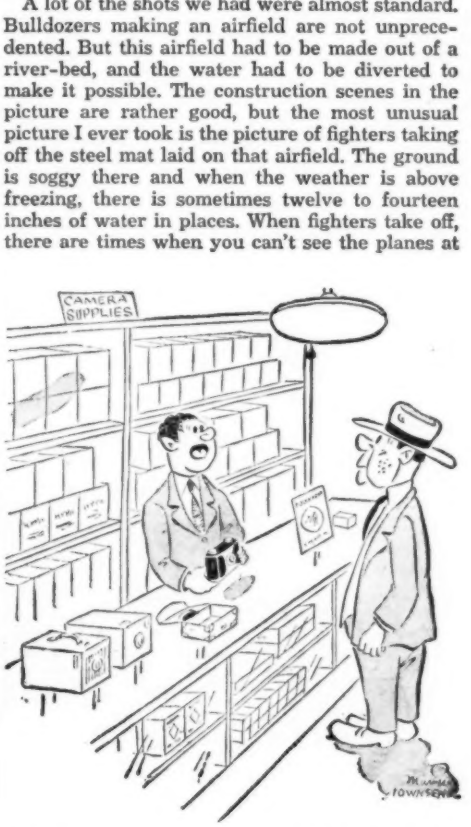
I Filmed Our Aleutian Victory

[*Continued from page* 37]

in a motion picture studio. At night I'd go to Captain Huston's tent, and he and I and Captain Scott would crouch as close as possible to the stove—we had only one bag of coal a week—and by candle-light work out the next day's work. The flashlight batteries soon gave out and we had to watch our candles too. Maybe you've seen the sketches a director makes for the guidance of the set-designers. Well, Captain Huston would sketch in charcoal—surprisingly well too— just the sort of shot he wanted to get of a given subject. For example, there's a scene in *Report From the Aleutians* where you see the church services going on while the bombers are loading up for Kiska. And you see the sermon being preached, and hear the roar of plane-motors overhead, and then you see the bombers roaring out to sea over the heads of the boys listening reverently to the chaplain. That was not a staged picture. It happened just that way. But we had to know it was going to happen that way and be ready for it.

A lot of the shots we had were almost standard. Bulldozers making an airfield are not unprecedented. But this airfield had to be made out of a river-bed, and the water had to be diverted to make it possible. The construction scenes in the picture are rather good, but the most unusual picture I ever took is the picture of fighters taking off the steel mat laid on that airfield. The ground is soggy there and when the weather is above freezing, there is sometimes twelve to fourteen inches of water in places. When fighters take off, there are times when you can't see the planes at



"This Camera shoots women and children best, it was made in Germany."

I Filmed Our Aleutian Victory

all. All you see is what looks like a lot of runaway geysers with propellers.

We put as many cameras over Kiska as possible, and I don't think that any one cameraman can point to any single foot of film and say that he, and no other, shot it. The time you're over the target is too short. Sometimes we went in so low down that those of us in the later bombers could see Japs on the ground trying to beat out the incendiaries with shovels. We'd often go in masthead height, not only because of the mist which hindered sighting, but because the Japs were so well dug in that we had to go low and hit hard and close to do any good.

There'd be as many as six of us cameramen in as many bombers, each with all the photographic equipment we could handle. I've had as many as three cameras going at once in my bomber. It was an hour-and-a-half ride from Adak to Kiska and the bomber-crew might be so calm that they'd play poker to pass the time on the way out. But I'd mount my camera with clamps to cover difficult fields of vision, and fuss with them to try to keep warm—a bomber is cold—until Kiska came into view through a hole in the fog that seemed always below us. Then the formation of bombers would tilt a little bit, and slide down a long, invisible decline, and we'd swallow to clear our eyes, and suddenly—very suddenly—we'd be in the clear, and there were rocky hills rushing at us and little blossoming puffs of smoke that looked merely interesting until the plane rocked from concussion. Then sharp peaks groped for us. We'd go down and down. We'd be lower than the two peaks we called Mutt and Jeff, bellowing along the valley between them and then like a quick dissolve we'd be out and over the Jap positions. We'd feel the little lurches as the bombs went away. Maybe we'd see the bursts of those from the planes ahead. And so around again, perhaps, with the interphones very quiet and tense until the bombardier said "Bombs away!"

Then we'd break loose. . . .

Oh, the swell feeling of the ride back home! Maybe we had some good film. Maybe not. But we'd tried. And anyway there were the bombs . . .

I'm glad I worked on *Report From the Aleutians*. I'm very glad we could make the kind of report we did.

Radium-like products of the atom-smashing cyclotron have proved helpful in reducing red-blood cell count in a deadly disease in which red cells over-crowd the body.

Five hundred thousand tons of new deposits of bauxite—the chief ore of aluminum—have recently been discovered in Georgia.

Some California Indian tribes used to enjoy cider made from manzanita berries, but this drink has gone out of fashion with them.

DAMN THE BOTTLE-NECKS

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Letter to a P.O.W.

WILL YOU WRITE a letter to a Prisoner of War . . . tonight?

Perhaps he was left behind when Bataan fell. Perhaps he had to bail out over Germany. Anyway, he's an American, and he hasn't had a letter in a long, long time.

And when you sit down to write, tell *him* why you didn't buy your share of War Bonds last pay day—if you didn't.

"Dear Joe," you might say, "the old topcoat was getting kind of threadbare, so I . . ."

No, cross it out. Joe might not understand about the topcoat, especially if he's shivering in a damp Japanese cell.

Let's try again. "Dear Joe, I've been working pretty hard and haven't had a vacation in over a year, so . . ."

Better cross that out, too. They don't ever get vacations where Joe's staying.

Well, what are you waiting for? Go ahead, write the letter to Joe. Try to write it, anyhow.

But if somehow you find you can't, will you do this? Will you up the amount you're putting into your Payroll Savings Plan—so that you'll be buying your share of War Bonds from here on in?

FAWCETT PUBLICATIONS, INC.

This advertisement prepared under the auspices of the War Advertising Council and the U. S. Treasury Department.

Continent Of Tomorrow

[*Continued from page* 43]

yourself. It's a cinch to cultivate. Wild land is cheap and there is plenty of it lying around. You can set out your own trees, or you can buy an orchard all cultivated for less than a dollar a tree. Each bush is planted between shady banana trees, several hundred to the acre. The natives don't even plough or hoe their orchards. But labor is cheap, when you can get it, especially in the interior where a peon gets only a few dollars a month. The laborer's family does its bit too. You will have to feed them all and provide them with a mudhut to live in. Besides, each worker gets a hat, three coarse shirts and three pairs of cotton overalls a year.

It will take years of peace to fill the world's cupboards cleaned out by the war, with chocolate. Maybe that's where you come into the picture.

Everybody knows what a "Panama" hat is. But how many people know that these hats come from Ecuador? The moment you get off the Grace Line boat at Guayaquil, you will be surrounded by a dozen ragged vendors of Panama hats. They will ask $25 for a hat, maybe more, because they have heard that that is what they bring in the States. Failing to make a sale, they finally offer it to you at their price—a dollar, maybe two.

No doubt, you'll go over to Montecristi, the district where the hats are made. Thereabouts is one of the few places where the *toquilla* palm is found, out of whose spine they weave the soft, fine, watertight hat which they call "Hippy Hoppy" (Jipijapi). It takes one person a couple of months to make a fine Panama hat. Ecquador turns out a million dollars' worth of them each year. Yet somehow, the business could stand all sorts of organization that would make more money for everybody, and more hats. Smart Americans are going to go down there and attend to it some day. Maybe you've got that sort of talent?

Guayaquil used to be the most unhealthy city in the world with an alarming rate of mortality from tropical fevers. They brought American Dr. Gorgas down there just after he had cleaned up Panama, and he made a spotless town of Guayaquil.

Only thirty-five years ago, you would have had to go up to Quito from Guayaquil on muleback. It took two weeks or more and cost $100. In 1908 they finished the railroad on which Oldtimer is conductor. The fare is $10 and it takes two days. Half way up, at Rio Bamba, you pause for the night, for everybody, including Senor Locomotive, to get his breath after the tedious climb. There's a suburb to the town called Bellavista that owes its existence to an American firm in Quito. During the second day's climb you will pass by Mt. Chimborazo, one of the highest Andes, whose 22,000 feet is twice as high as Quito.

Chimborazo is one of Nature's strangest children. It is almost on the torrid Equator, yet due

[*Continued on page* 160]

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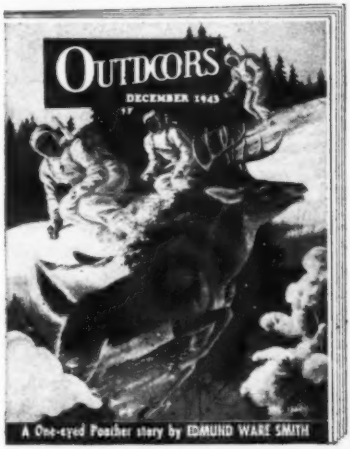

DECEMBER OUTDOORS brings a deer hunting yarn about the misadventure of Uncle Jeff Coongate, notorious Poacher of Privilege whose previous misdeeds have been chronicled in ESQUIRE. Other stars in the December firmament are Stephen Leacock, Arthur R. Macdougall, Jr., Edward C. Janes and Havilah Babcock.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of MECHANIX ILLUSTRATED published monthly at Louisville, Kentucky, for October 1, 1943.

State of Connecticut } ss.
County of Fairfield }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Gordon Fawcett, who, having been duly sworn according to law, deposes and says that he is the Business Manager of MECHANIX ILLUSTRATED and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Fawcett Publications, Inc., Greenwich, Conn.; Editors, Roland Cueva, Manhasset, L. I., N. Y., and Donald Williams, New York, N. Y.; Managing Editor, Ralph Daigh, New Rochelle, N. Y.; Business Manager, Gordon Fawcett, Stamford, Conn.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Fawcett Publications, Inc., Greenwich, Conn.; W. H. Fawcett, Jr., Norwalk, Conn.; Marian Bagg, Tulsa, Okla.; Roger Fawcett, Larchmont, N. Y.; V. D. Fawcett, Stamford, Conn.; M. B. Fawcett, Norwalk, Conn.; H. A. Fawcett, Larchmont, N. Y.; Roscoe Kent Fawcett, Greenwich, Conn.; M. F. Fawcett, Greenwich, Conn.; W. H. Fawcett Trust, Greenwich, Conn.; Roscoe Fawcett Trust, Minneapolis, Minn; V. L. Buckley, Santa Barbara, Cal.; Mrs. Eva Roberts, Seattle, Wash.; Fawcett Publications, Inc.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is _____. (This information is required from daily publications only.)

GORDON W. FAWCETT,
Business Manager.

Sworn to and subscribed before me this 1st day of October, 1943.
[Seal.] LILLIAN M. BUSHLEY,
Notary Public.
(My commission expires February 8, 1948.)

Continent Of Tomorrow

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to its great height its sides are covered with perpetual snow and ice, while inside is one of the biggest furnaces on earth, because it is a fierce burning volcano. Once in about every fifty years it boils over and covers the countryside for scores of miles around with molten lava. You had better arrange to be somewhere else when that happens. Anyway, seen from the safe distance of Quito it is a glorious sight; a gleaming palace of ice by day and a giant lantern hanging from the tropical blue sky at night.

On that memorable journey up from Guayaquil to Quito you will pass through all the zones of climate found on earth, from the Equator to the Arctic region.

Quito is an ancient Indian city on which architectural beauties from old Spain have been piled and set in the crotch of a mountain top. Cathedral, churches, plazas and colonnades have changed little throughout the centuries. Everywhere, all day and all night long, like ghosts of their great-great-grandfathers, stalk and plod burden-bearing Indians.

You can stop at the Metropolitan Hotel for fifteen sucres, or about $3 a day, or go down street to the Savoy for $2. After listening to the military band concert, you may go to the movie palace for a quarter. So that you won't be bored, refugees are setting up night clubs.

Stay in Quito long enough and you'll meet up with all sorts of adventurous prospectors coming in from the Oriente. They usually go on a seven-day binge trying to make up for the hardships they have endured out there. They'll show you actual gold and tell you fantastic tales of the riches to be found in that mystic land, where you just step off the deep end of civilization into a vast expanse of the globe uncharted in any geography. Keep on going for a thousand miles and you may strike the Amazon basin. It has everything, they will tell you—gold, silver, rubber, cougars, boa constrictors, alligators and yellow fever. Yet, they all keep going back for more. One day you will meet one of them coming out for good, on his way back home—rich!

It is a machineless country; almost no factories. With all their million-manpower of Indian labor at a few cents an hour they are not getting anywhere. Transportation is one of their weakest points; manufactured goods must be imported. Lumber, lard, kerosene and barbed wire furnish a lively trade with the United States from whom they buy nearly 50 per cent of their needs, and sell us produce of approximately the same value.

At a grand result of all this backwardness in a forward age, Ecuador is a needlessly poor country with its backyard filled with buried riches. Like all mountainous countries Ecuador is rich in minerals. Silver ore is plentiful up there in the Andes. Large deposits of copper, iron, coal and sulphur are known to exist, but

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nobody has done too much about it. Or, if it's gold you are looking for, washings are common in many parts of the country where there might be mines. There are a few mines at Cuenca, easily reached by railroad plus a mule ride; but they are only fiddling with the ore. Or, a government railroad will take you straight to Machala where some gold mining is going forward.

There's promise of a bright future in oil, in Ecuador. At Salinas, 108 miles from Guayaquil, you'll find salt, sulphur and pitch dribbling in from the back country. More significant are the petroleum fields in the vicinity that foreigners are beginning to develop.

Just about nineteen-twentieths of the country is waiting to be developed. After that, everything in Ecuador will pay even richer dividends than they have been doing; from cocoa farming to banking in Guayaquil and Quito.

A big change is in store for Ecuador, and all the rest of the South American countries, when this war is over; when thousands of left-over war planes are going to break up all these bottlenecks of transportation down there. Take that tedious trip from Guayaquil to Quito that now takes two days. A single giant cargo plane will carry up nearly as much as the whole steam train, in about two hours. Planes will dry up the deepest sea and level the highest mountains for you on that trip to Ecuador. And once you get down there, planes will carry you anywhere you want to go with helicopters to drop you in any spot in the wildest virgin country.

You may find your bonanza lying somewhere in the neighborhood of Ecuador.

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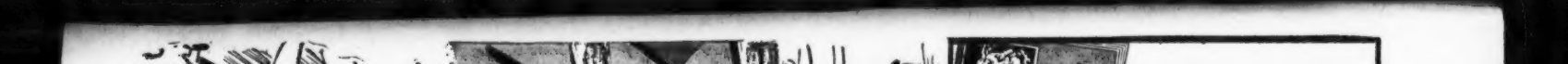
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